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ALTERNATIVE FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

NINETY-EIGHTH CONGRESS

FIRST SESSION

ON THE

ALTERNATIVE FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR

SEPTEMBER 22, 1983

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ALTERNATIVE FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR

THURSDAY, SEPTEMBER 22, 1983

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, D.C.

The committee met, pursuant to notice, at 2 p.m., in room SD-366, Dirksen Office Building, Hon. James McClure (chairman), presiding.

Present: Senators McClure, Domenici, Murkowski, Nickles, Hecht, Bumpers, and Bradley.

Also present: Paul Gilman and Elliot Chakoff, professional staff members; and Benjamin S. Cooper, professional staff member for the minority.

OPENING STATEMENT OF HON. JAMES A. McCLURE, A U.S. SENATOR FROM THE STATE OF IDAHO

The CHAIRMAN. The committee will come to order.

I hesitate to start the hearing by an apology, but I think one is due. The business on the floor of the Senate is sometimes demanding and there is a rollcall vote on an amendment which I offered. I thought I'd better be there. I appreciated the help and support we got from all members.

We do have an important issue to deal with today. Our leadoff witness this afternoon is our colleague from the Senate, the Honorable Gordon J. Humphrey, U.S. Senator from New Hampshire. You're very welcome before this committee.

[The prepared statement of Senator McClure follows:]

OPENING STATEMENT OF HON. JAMES A. MCCLURE, A U.S. SENATOR FROM THE STATE OF IDAHO

GOOD AFTERNOON LADIES AND GENTLEMEN. TODAY'S HEARING IS TO CONSIDER THE ALTERNATE FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR, WHICH WAS SUBMITTED TO THE CONGRESS ON AUGUST 1, 1983, PURSUANT TO THE DIRECTIVE OF CONGRESS INCLUDED IN THE FY 83 CONTINUING APPROPRIATIONS ACT (P.L. 97-397). AS I AM SURE MANY OF YOU ARE AWARE, THE ORIGINS OF THIS PROJECT DATE BACK TO PUBLIC LAW 91-44 WHICH WAS SIGNED INTO LAW IN 1969. IT IS ALSO WELL KNOWN THAT THE PROGRESS ON THIS PROJECT HAS NOT BEEN SMOOTH. THE ATTEMPTS OF THE PREVIOUS ADMINISTRATION TO DELAY OR CANCEL THIS PROJECT ARE WELL DOCUMENTED. THE LICENSING PROCESS HAS BEEN STOPPED, ISSUES OF NUCLEAR PROLIFERATION, THE RELEASE OF A WHITE PAPER ON SAFETY ISSUES, ATTACKS ON THE ECONOMICS, AND EVENTUALLY THE DIVERSION OF APPROPRIATED FUNDS TO TERMINATE THE PROJECT WHICH WAS STOPPED BY THE GAO, WERE A FEW OF THE ATTEMPTS MADE BY THE CARTER ADMINISTRATION. THROUGH FOUR YEARS OF CONFRONTATION WITH THE CONGRESS, THAT ADMINISTRATION FAILED TO KILL THE PROJECT EFFORTS.

THOSE WERE NOT HARMLESS, HOWEVER. THE DELAY THEY CAUSED AS THE CONGRESS PROVIDED FUNDS SUFFICIENT ONLY TO KEEP THE PROJECT ALIVE IS THE ROOTS OF TODAY'S DIFFICULTIES WITH THE PROJECT. COSTS INCREASED AND DESIGNS HAD TO BE UPDATED. IN SPITE OF THIS, THE LICENSING PROCESS IS BACK ON TRACK. THE PROJECT HAS A LIMITED WORK AUTHORIZATION AND A CONSTRUCTION PERMIT APPEARS TO BE CLOSE AT HAND. DESIGN WORK HAS BEEN UPDATED AND IS OVER 90% COMPLETE.

THE SUPPORT OF THOSE WHO BELIEVE THE BREEDER REACTOR IS OUR QUICKEST ROUTE, THOUGH NOT OUR ONLY ROUTE, TO INEXHAUSTIBLE ENERGY CONTINUE TO SUPPORT THE BREEDER PROGRAM AND CLINCH RIVER AS THE LINCHPIN IN REALIZING THIS OPTION. CLINCH RIVER IS OUR TICKET TO PARTICIPATE IN THE INTERNATIONAL MARKET FOR BREEDER TECHNOLOGY. IT IS THE KEY TO A LEADERSHIP ROLE FOR THE UNITED STATES IN THE EVOLVING NUCLEAR NONPROLIFERATION EFFORTS.

Over the past few years the nations economic and budgetary problems have increasingly been felt by the Clinch River Project. The Congress has hesitated to fully fund the project. The supporters have realized this and Senators Jackson, Johnston, Baker and I have encouraged efforts to balance those concerns with our need to continue with this project. Others in the Congress agreed and the result was a directive in P.L. 97-397 to the Administration to develop an alternate financing scheme which would increase the share of the private sector in the cost of construction for the project.

The Secretary of Energy has responded by transmitting a plan, conceived in the private sector by the Breeder Reactor Task Force, which would succeed in increasing the private sector share of construction costs if implemented. It would provide $1 billion, fully 40% of the cost of completion of the project, through non-Federal investment.

I would like to take this opportunity to commend the President, Secretary Hodel, Budget Director Stockman and members of industry and utilities for a year long effort to put this plan together.

I would also like to take this opportunity to announce the intention of Majority Leader Baker, Senators Johnston, Sasser and myself to offer appropriation language to put the necessary plan into effect by making a one-time Appropriation of Federal funds and permitting the Secretary to avail himself of the private sector interest in this project.

STATEMENT OF HON. GORDON J. HUMPHREY, A U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator HUMPHREY. Under the circumstances, that's remarkable, but thank you very much for welcoming me, Mr. Chairman. And thank you further for holding a hearing on the subject of the alternate financing plan.

I hope that as a continuation of the orderliness of the procedure that we can proceed ultimately on a separate bill and that both houses will have an opportunity to review the matter in conjunction with a separate bill.

I suppose at this point my point of view on Clinch River is well known. I would simply like to say briefly that I regard it as unnecessary and it would seem the Secretary of Energy himself agrees by virtue of a number of public interviews that it is not essential to our base breeder reactor research program, that in order to preserve our breeder or breeder reactor option for the future, it's only necessary that we maintain that base program and Clinch is not part of that base program.

Mr. Chairman, with your permission I would like to display a couple of charts. Inasmuch as Congress is being asked to undertake on behalf of the taxpayers a 30-year obligation which is predicated on the number of important assumptions which might or might not be borne out, I think it might be instructive to the committee to establish it in perspective to view these charts.

The charts are designed to show the uncertainties, historical uncertainties with regard to the project both in terms of the construction time and the cost estimates. The first chart displayed shows the period from 1974 to the present and indicates that no matter when you ask, on the five times when the official construction forecasted a change, we're always 7 years away from completion. This is even before we got into delays caused by the previous administration. So when we propose to undertake a 30-year obligation we have to bear in mind the uncertainties displayed on this chart. No matter where we are we're 7 years from completion.

The second chart deals with cost, and again with five official cost estimates over the years from 1974 to present, expressed in dollars, that's the red line above. Present dollars we're told if we only spend another $2 billion or so we'll be able to complete this plant. And again that gives this member a great deal of uneasiness about obligating the taxpayers on a 30-year program predicated on cost estimates that are problematical.

If I may, Mr. Chairman, I would simply like to place my statement in the record and highlight the differences between, some of the principle differences between the old Clinch plan and the new proposed Clinch plan.

Under the old plan the taxpayers own it inasmuch as we've spent about $1.5 billion so far. And for that amount of money the American people are at least entitled to the title of the plant if it is completed, and yet under the plan we will have to surrender the title to the plant. Likewise we will have to surrender ownership of the revenues, and those are worth about $110 million per year according to the CBO.

What bothers me most of all is under the new plan Congress will surrender practical oversight capability over this project once and for all. Presently at least we get the annual appropriations, oversight over the annual appropriation progress. But if the alternative passes, there will be a one time appropriation and that will be the end of it as far as Congress goes, at least for a number of years until we're well committed into this thing and there will be no possibility of turning back in any case.

Likewise, our obligation under the present arrangement is for 5 years. TVA has agreed to contract to operate it for 5 years. And as you know the alternative plan obligates us to operate it providing revenues whether the plant works or not or how well it works for 30 years. And if it doesn't work out well, then we know who will make up the difference and service the debt.

I'm not a high financier, Mr. Chairman, but I must say the new financing plan makes the old one look good.

The **Chairman**. Would you support the old one then?

Senator **Humphrey**. Would you support a separate bill?

The **Chairman**. Would you support the old one if it looks so good?

Senator **Humphrey**. No; I didn't say that. Even if it were, the old plan is more straight-forward and on budget. I like that, that's appealing. I know that appeals to the Chairman, too in all matters. But inasmuch as I view the plant as nonessential and my point of view has been backed up by the Secretary of Energy, I believe, I don't think there is any relevance in discussing how we're going to finance it. But that of course is the subject of this hearing. We're going to have to surrender the revenue stream, we're going to have to encourage the investors with guarantees, we're going to have to encourage them with substantial tax advantages, which mean reduced revenue to the Government, which is not a whole lot different than up front appropriations. So it seems to me that this is simply a back door way of financing something that we don't need.

The **Chairman**. Your statement will be placed in the record in full.

[The prepared statement of Senator Humphrey follows:]

Statement of Hon. Gordon J. Humphrey, a U.S. Senator From the State of New Hampshire

FIRST, I WOULD LIKE TO THANK THE CHAIRMAN FOR HOLDING THESE HEARINGS AND INVITING ME TO SPEAK HERE TODAY ABOUT THE PROPOSED GOVERNMENT-GUARANTEED OFF-BUDGET FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR. I BELIEVE THIS PROJECT AND ITS FINANCING ARE TOO IMPORTANT AND TOO CONTROVERSIAL NOT TO BE HANDLED IN THE NORMAL WAY WITH HEARINGS, SEPARATE LEGISLATION, REFERRAL TO THE APPROPRIATE AUTHORIZING AND APPROPRIATING COMMITTEES IN THE HOUSE AND SENATE, AND MARK-UPS. I THANK THE CHAIRMAN FOR HOLDING THESE HEARINGS, THEN, AND DO SO UNDER SUCH SHORT NOTICE.

AS MANY OF YOU KNOW, I HAVE OPPOSED FURTHER FEDERAL SUPPORT FOR THE CLINCH RIVER BREEDER REACTOR PROJECT ON THE GROUNDS THAT IT IS UNNECESSARY AND HAS BECOME A NATIONAL EMBARRASSMENT BECAUSE OF ITS EVER INCREASING COST. THIS NEW FINANCING PROPOSAL, HOWEVER, ADDS A NEW WRINKLE TO THE PROJECT--IT ACTUALLY MAKES MATTERS WORSE BY INCREASING THE PROJECT'S COST AND THE GOVERNMENT'S EXPOSURE TO RISK.

TO PUT THE PROJECT AND THIS LATEST FINANCING PLAN INTO PRESPECTIVE, IT IS ESSENTIAL TO FOCUS ON FOUR POINTS

* FIRST, UNLIKE DOE'S BASE BREEDER RESEARCH AND DEVELOPMENT PROGRAM, CLINCH RIVER IS A LUXURY AND IS NOT NEEDED TO KEEP THE U.S. AHEAD IN BREEDER RESEARCH AND DEVELOPMENT. THIS WAS FIRST POINTED OUT BY THE ENERGY DEPARTMENT'S OWN BLUE-RIBBON ENERGY RESEARCH ADVISORY BOARD IN NOVEMBER OF 1981. IN ITS REPORT TO THE SECRETARY OF ENERGY, THE BORAD

EMPHASIZED THAT THE EXISTING BASE BREEDER RESEARCH AND DEVELOPMENT PROGRAM (NOW SEPARATELY BUDGETED AT MORE THAN $300 MILLION) SHOULD BE MAINTAINED SINCE IT WAS LEGITIMATE RESEARCH AND DEVELOPMENT BUT THAT THE CLINCH RIVER BREEDER REACTOR PROJECT, A DEMONSTRATION EFFORT, NO LONGER WAS AN URGENT PRIORITY AND SHOULD BE DEFERRED. THE RAND CORPORATION'S PRESIDENT, DONALD RICE, RECENTLY REITERATED THE SAME POINT IN A REPORT TO SENATOR HEINZ AND ME. MORE IMPORTANT, THE SECREATRY OF ENERGY HAS EXPLICITLY STATED (SEE INTERVIEW, *NUCLEONICS WEEK*, JUNE 30, 1983 AND *THE LOS ANGELES TIMES*, JUNE 27, 1983) THAT THE CLINCH RIVER BREEDER REACTOR IS NOT NEEDED TO KEEP US AHEAD IN BREEDER RESEARCH AND DEVELOPMENT AND THAT THE KEY TO SECURING BREEDER FOR THE FUTURE LIES IN MAINTAINING OUR BASE PROGRAM. THIS PROGRAM FEATURES THE WORLD'S LARGEST AND NEWEST RESEARCH BREEDER REACTOR, THE FAST FLUX TEST FACILITY, AND THE EXPERIMENTAL RESEARCH BREEDER, EBR II. GIVEN THESE TWO ADVANCED FACILITIES AND THE YEARS OF EXPERIENCE GAINED FROM THE OPERATION OF FERMI I, A COMMERCIAL PLANT OWNED AND OPERATED ENTIRELY BY PRIVATE INDUSTRY, CONSTRUCTION OF CLINCH RIVER IS NOT CRUCIAL TO SECURING BREEDERS IN THE FUTURE, 50 OR MORE YEARS FROM NOW WHEN CHEAP ORE MAY BE SCARCE AND BREEDER REACTORS MAY BE ECONOMICALLY DESIRABLE.

* SECOND, DESPITE WHAT ITS MAJOR CONTRACTORS MAY SAY, THE CLINCH RIVER PROJECT HAS A PERSISTENT HISTORY OF COST OVERRUNS AND CONSTRUCTION SCHEDULE SLIPPAGE THAT WARNS AGAINST ANY EFFORT TO FINANCE IT EITHER OFF-BUDGET OR WITH GOVERNMENT-GUARANTEES. SUCH OFF-BUDGET ENTERPRISE FINANCING, AFTER ALL, ASSUMES THAT THE ENTERPRISE HAS A SET COST AND COMPLETION DATE. AND THIS IS PRECISELY WHAT WE DO NOT KNOW FOR CLINCH RIVER. IN FACT, DOE JUST REVISED THE COMPLETION DATE AND COST ESTIMATES

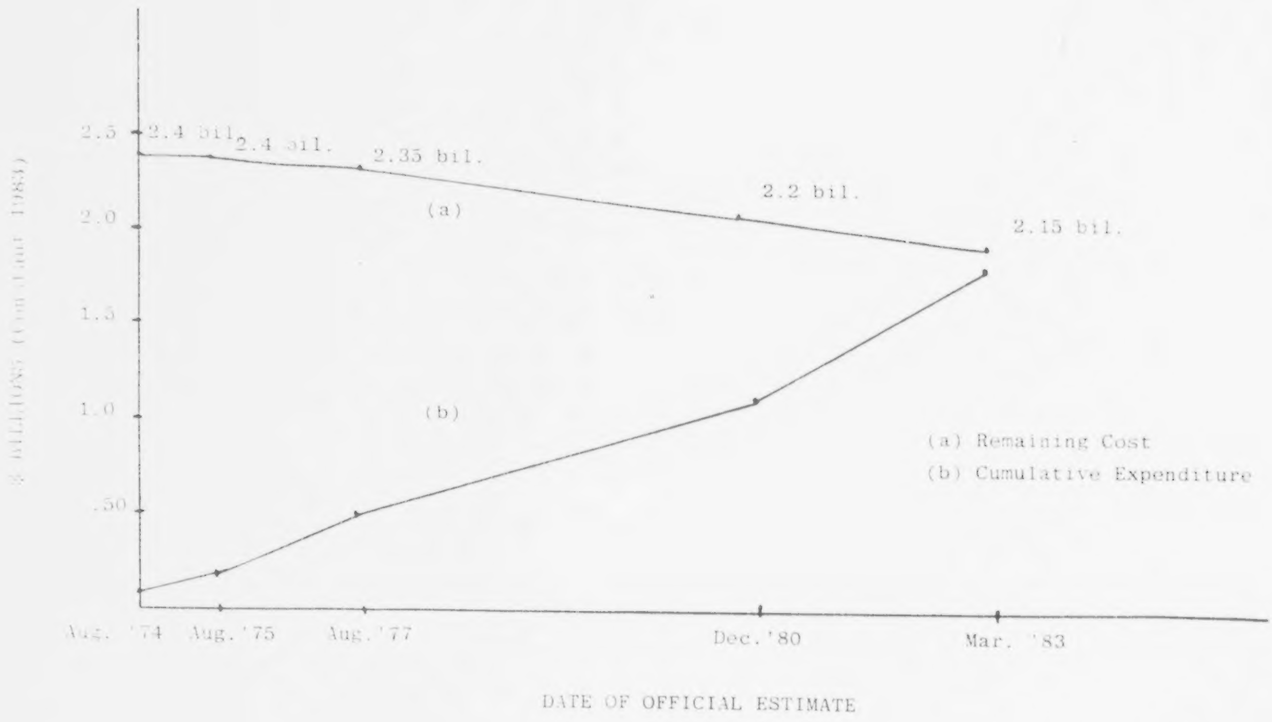
MADE IN MARCH (AND ASSUMED BY THE FINANCING PLAN'S TASK FORCE) UPWARD BY AS MUCH AS 15 MONTHS AND $123 MILLION. AND DOE'S OWN INDEPENDENT COST ESTIMATE TEAM HAS SUGGESTED THAT EVEN THIS REVISION IS TOO LOW.

THIS SLIPPAGE IS NOT ACCIDENTAL. IT HAS BEEN A PROJECT CONSTANT FOR AT LEAST THE LAST DECADE. INDEED, THE CONGRESSIONAL RESEARCH SERVICE (CRS) RECENTLY COMPLETED A STUDY THAT DETERMINED THAT THE CLINCH RIVER BREEDER REACTOR HAS ALWAYS BEEN AT LEAST 7 YEARS AND $2.1 BILLION (IN CONSTANT 1983 DOLLARS) AWAY FROM COMPLETION (SEE ATTACHED CHARTS). THIS HAS BEEN THE CASE EVERY YEAR SINCE 1974 WHEN THE FIRST "FIRM" OFFICIAL COMPLETION COST ESTIMATES ON THE PROJECT WERE MADE. THIS WAS THE CASE THREE YEARS BEFORE THERE WAS ANY EXECUTIVE SLOWDOWN ON THE PROJECT, AND THIS IS THE CASE EVEN NOW AFTER $1.5 BILLION (IN YEAR OF EXPENDITURE DOLLARS) HAS BEEN SPENT ON THE PROJECT, OVER 90 PERCENT OF THE PROJECT'S DESIGN IS COMPLETE, AND 70 OF IT COMPONENTS HAVE BEEN ACQUIRED.

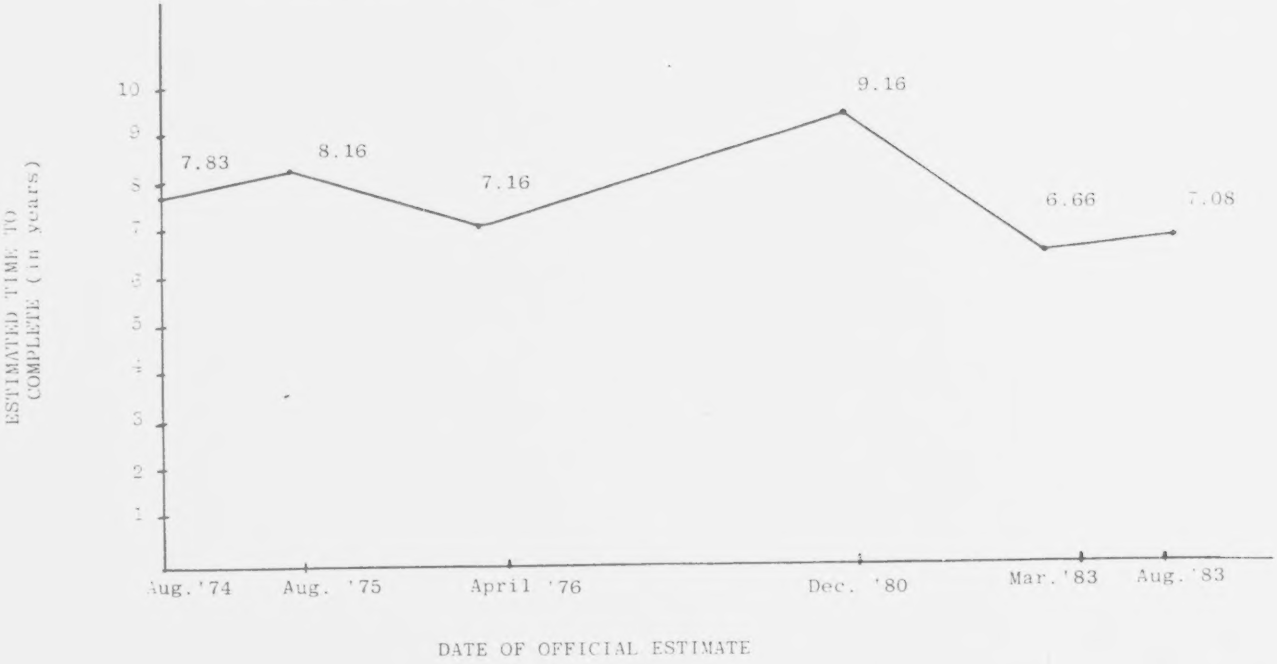
SOME HAVE ARGUED THAT THIS SLIPPAGE IS MERELY THE RESULT OF CONTROVERSY CAUSED BY THE PROJECT'S OPPONENTS. THIS THESIS, THOUGH, IS SIMPLY TOO CONVENIENT. AS THE CHARTS MAKE CLEAR, THE PROJECT CONSTANTLY SLIPPED FROM 1974 TO 1976, EVEN WHEN THE PROJECT HAD FIRM POLITICAL SUPPORT. SINCE 1981 THE PROJECT ALSO HAS BEEN PLACED ON A FAST LICENSING TRACK AND SITE PREPARATION WORK HAS BEEN SPED UP. PERHAPS THE PROJECT'S PROMOTERS ARE TOO OPTIMISTIC ABOUT THE PLANT'S COSTS. PERHAPS THE PROJECT IS MISMANAGED. THESE ARE THE QUESTIONS THAT NEED TO BE ANSWERED.

IN ANY CASE, ANY HOPE THAT THE CONTROVERSY SURROUNDING THIS PROJECT WILL SUBSIDE WITH THE PASSAGE OF THE PROPOSED PLAN OR ONE MORE YEAR'S WORTH OF FUNDING IS UNSOUND. ONCE CONCRETE IS POURED, CONGRESS IS VIRTUALLY CERTAIN TO HAVE TO PAY OUT MORE TO COVER FURTHER COST

NO MATTER HOW MUCH YOU SPEND OR
WHEN YOU ASK -- CLINCH RIVER IS ALWAYS
$2.1 BILLION OR MORE AWAY FROM COMPLETION



NO MATTER WHEN YOU ASK --
1974 or 1983 --
CLINCH RIVER IS ALWAYS 7
OR MORE YEARS FROM COMPLETION



OVERRUNS. ALSO, THERE IS ALMOST CERTAIN TO BE OPERATION AND FUELING COST OVERRUNS.

MOST IMPORTANT, ONCE CLINCH RIVER CONSTRUCTION IS UNDERWAY IN EARNEST, CONGRESS WILL BE ASKED TO SPEND MORE MONEY ON ADDITIONAL SUPPORT FACILITIES--BREEDER REPROOCESSING AND FUEL FABRICATION PLANTS--AND A FOLLOW-ON BREEDER DEMONSTRATOR. NONE OF THIS MAKES MUCH SENSE GIVEN THE CONCLUSION REACHED BY DOE'S OWN ENERGY RESEARCH ADVISORY BOARD AND THE SECRETARY THAT BREEDER DEMONSTRATION ACTIVITY IS UNNECESSARY NOW. BUT ALL OF IT WILL BE "NECESSARY" IF CLINCH RIVER IS BUILT. TO BELIEVE THE CONTROVERSY SURROUNDING THIS PROJECT WILL SUBSIDE WITH PASSAGE OF THIS PLAN, THEN, IS SIMPLY FOOLISHNESS.

* THIRD, ALTHOUGH CONGRESS ASKED FOR INCREASED COST SHARING, INDUSTRY'S PROPOSED FINANCINC PLAN ACTUALLY WOULD INCREASE THE COST OF THE PROJECT. AS I HAVE POINTED OUT SEVERAL TIMES BEFORE, AND AS THE BREEDER REACTOR CORPORATION TASK FORCE ADMITS, PRIVATE FINANCING IS ALWAYS MORE EXPENSIVE THAN PUBLIC FINANCING. WHEN YOU ADD TAX BENEFITS TO SUCH FINANCIAL PARTICIPATION, THE COSTS OF SUCH OFF-BUDGET FINANCING SIMPLY INCREASE. MY OWN STAFF'S ESTIMATES WERE THAT THE PLAN WOULD ADD FROM BETWEEN $150 MILLION TO $300 MILLION TO THE COST OF PROJECT.

THIS TUESDAY THESE ESTIMATES WERE CONFIRMED BY THE CONGRESSIONAL BUDGET OFFICE (CBO). IN TESTIMONY BEFORE THE SUBCOMMITTEE ON ENERGY, CONSERVATION, AND POWER OF THE HOUSE COMMITTEE ON ENERGY AND COMMERCE, THE NEWLY APPOINTED DIRECTOR, RUDOLPH PENNER, MAINTAINED THAT THE PLAN WOULD ADD $2.6 BILLION TO THE FEDERAL DEFICIT FROM 1990 TO 2020 AND THAT EVEN WHEN DISCOUNTED, THE COST OF THE PLAN TO THE U.S. TREASURY WOULD BE ALMOST $250 MILLION MORE THAN IF THE CONGRESS CHOSE TO FULLY FUND THE

PROJECT. MR. FENNER ALSO NOTED THAT IT WAS LIKELY THAT THE AFTER-TAX RATE OF RETURN EARNED BY THE SO CALLED EQUITY INVESTORS UNDER THE PLAN WOULD BE NEARLY 37 PERCENT AS A RESULT OF GOVERNMENT-GUARANTEED TAX BENEFITS THAT THEY WOULD RECEIVE.

WITH THIS AS AN INTRODUCTION, THIS PLAN ACTUALLY MAKES THE ARRANGEMENTS WE NOW HAVE LOOK PRETTY GOOD. AS CAN BE SEEN IN THE ATTACHED COMPARISON CHART BELOW, THE UTILITIES' ORIGINAL $257 MILLION-PLUS INTEREST PLEDGE (ESTIMATED TO BE WORTH A TOTAL OF $330 MILLION) NOW DEFRAYS ONLY 8 % OF THE PROJECT'S OFFICIAL ESTIMATED COST OF $4 BILLION. YET, EVEN SO, THIS ORIGINAL ARRANGEMENT STILL COMPARES QUITE FAVORABLY AGAINST THE PROPOSED FINANCING PLAN (SEE CHART FOLLOWING):

PROPOSED CLINCH FINANCING PLAN AS COMPARED TO THE ORIGINAL PLAN AND THE EXISTING SITUATION

Original Plan('73)	The Existing Situation	The Proposed Plan
The U.S. owns plant and may sell it	Same as original plan	U.S. surrenders title and right to sell plant to CRBR Joint Venture
The U.S. receives all revenues plant might produce	Same as original plan	U.S. surrenders all plant revenues to CRBR Joint Venture
Congress oversees project's progress with annual appropriation	Same as original plan	Congress loses annual appropriations review approves single multi-year obligation
U.S. may terminate project's operation after 1st 5 years	Same as original plan	U.S. must operate plant for 30 years
U.S. only provides fuel for plant's 1st 5 years	Same as original plan	U.S. provides all fuel services for 30 years including breeder reprocessing, fuel fabrication
U.S. assumes no obligations regarding plant revenues	Same as original plan	U.S. must guarantee against CRBR going into red for 30 years
U.S. Treasury loses no revenues from project tax benefits	Same as orginal plan	Treasury loses nearly $250 mil.(constant, discounted 1983 $s) in tax and interest revenues
Nuclear industry contributes nearly 40% of plant's projected cost	Nuclear industry's pledge now constitutes 8% of plant's DOE projected cost	Nuclear industry's pledge remains fixed; no new venture captial is given or placed at risk

INDEED, UNDER THE NEW PLAN THE FEDERAL GOVERNMENT WOULD HAVE TO SURRENDER TITLE TO THE PLANT AND ALL REVENUES IT MIGHT PRODUCE. CONGRESS WOULD LOSE ITS ANNUAL APPROPRIATIONS OVERSIGHT OF THE PROJECT'S CONSTRUCTION, AND THE FEDERAL GOVERNMENT WOULD HAVE TO EXTEND ITS FUELING AND OPERATION RESPONSIBILITIES OVER THE PLANT FOR AN ADDITIONAL 25 YEARS. IN EXCHANGE, THE TREASURY WOULD LOSE NEARLY A QUARTER OF A BILLION DOLLARS (DISCOUNTED, 1983 DOLLARS) IN INCREASED PROJECT FINANCING AND TAX BENEFITS. THE NUCLEAR INDUSTRY WOULD NOT HAVE TO PLACE ANY ADDITIONAL VENTURE CAPITAL AT RISK AND SUPPORTERS OF THE PROJECT COULD MAKE IT APPEAR THAT THEY HAD REDUCED SPENDING ON THE PROJECT BY POINTING OUT THE PLAN'S NEAR-TERM EFFECTS.

THIS IS WHAT THE PLAN COSTS US IF ALL GOES WELL. A NUMBER OF THINGS COULD GO WRONG. FIRST, ACCORDING TO THE GENERAL ACCOUNTING OFFICE, THERE MAY BE FURTHER COST OVERRUNS. THE PLANT'S FUELING MAY COST MUCH MORE THAN DOE OPTIMISTICALLY PROJECTS. AND THE PLANT'S POWER MAY NOT BE PRODUCED OR SOLD AT THE RATES HOPED FOR. IN ANY OF THESE CASES, THE PLAN REQUIRES THAT THE GOVERNMENT'S TAXPAYERS PICK UP THE TAB AND NOT FOR 5 YEARS (AS THE EXISTING CONTRACT WITH THE TENNESSEE VALLEY AUTHORITY REQUIRES), BUT FOR A FULL 30-YEAR PERIOD.

* THIS, THEN, BRINGS ME TO MY FINAL POINT. GIVEN HOW POORLY THIS PLAN COMPARES TO OUR CURRENT SITUATION, I THINK IT IS ESSENTIAL THAT THIS PLAN NOT JUST BE DISCUSSED, BUT REVIEWED AND MODIFIED BY THE APPROPRIATE AUTHORIZING AND APPROPRIATING COMMITTEES. THIS MEANS SEPARATE LEGISLATION. AS SENATOR BUMPERS AND I HAVE NOTED BEFORE, WE WOULD WELCOME EXPEDITIOUS CONSIDERATION OF SUCH LEGISLATION. HOWEVER, I BELIEVE THIS LEGISLATION MUST COME SOON AND DEFINITELY BEFORE ANY

FURTHER FUNDS FOR THE PROJECT ARE REQUESTED. IN NO CASE SHOULD REQUESTS FOR FURTHER PROJECT SPENDING AUTHORITY BE ATTACHED TO THE CONTINUING RESOLUTION. INDEED, CONGRESS HAS SPOKEN FOR FAR TOO LONG AGAINST ANY FURTHER FUNDING WITHOUT SUBSTANTIAL, INCREASED COST SHARING FIRST BEING ENACTED TO LEAVE THIS MATTER TO ANY LAST MINUTE PROCEEDURE. CONGRESS CLEARLY ASKED FOR INCREASED INDUSTRY COST SHARING IN DECEMBER OF LAST YEAR AND REPEATED THIS DEMAND IN MAY AND JUNE OF THIS YEAR. THE ONLY WAY CONGRESS MAY GET IT IS BY STICKING TO ITS JUNE ENERGY AND WATER APPROPRIATONS CONFERENCE REPORT DEMAND THAT SUCH COST SHARING BE ENACTED BEFORE FURTHER FUNDS ARE AUTHORIZED. IN THIS REGARD, THE BALL IS STILL IN INDUSTRY'S COURT.

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Senate

CLINCH RIVER—OUT OF FUEL

● Mr. HUMPHREY. Mr. President, on November 30, and December 6 and 7, I entered into the Record material concerning the high costs of constructing and operating the Clinch River breeder reactor project. Today I would like to examine a new difficulty with the project—by the Department of Energy's (DOE) own accounts there is not enough plutonium available to fuel it.

The first indication that there would be difficulty fueling the project came last year in March in testimony Dr. Charles Gilbert, Acting Deputy Assistant Secretary for Nuclear Materials gave before a House Armed Services Committee hearing. At that time Dr. Gilbert stated that DOE probably would run short of fuel-grade plutonium by the late 1980's.

Rather than use all of this lower purity plutonium to fuel Clinch River and other breeder work, DOE is now blending it with very pure supergrade plutonium to produce materials suitable for modernizing our aging nuclear weapons force. If Clinch River is to stay on track and stay within current cost estimates, though, DOE must begin fueling the reactor in 1987 with an immense amount of plutonium. Indeed through 1986 when the reactor is supposed to be sold, the project will require 10,296 kilograms of plutonium. This amount, if blended with supergrade plutonium could produce from between 2,500 to 5,000 warheads and would go a long way to relieve the current pressure to build a new military production reactor under a crash deadline, as recently reported in the Washington Post.

Clinch River's supporters, however, insist that the plutonium is readily available. In its latest report on Clinch River, the General Accounting Office [GAO] concluded otherwise. The GAO examined four possibilities—taking the plutonium from the military stockpile and trying to return it from material bred in Clinch River, reprocessing light water reactor spent fuel in a commercial facility, reprocessing light water reactor fuel at military facilities, and buying foreign plutonium. None of these options, according to GAO, will be able to provide plutonium early enough to meet DOE's Clinch River fueling schedule. Indeed, Ken Davis, former Deputy Secretary of Energy said as much on September 9, 1982, when he testified before the Senate Subcommittee on Energy, Nuclear Proliferation, and Governmental Processes. He emphasized that we do not have enough plutonium stockpiled to run Clinch River if it is built.

DOE's Assistant Secretary for Nuclear Energy and Deputy Assistant Secretary for breeder reactor programs, though, gloss over this point. In their latest breeder publication, National Breeder Reactor Program Rationale and Clinch River Project Facts, they talk about returning plutonium to the military stockpile even though this cannot be done without breeder reprocessing plant, the completion of which is at least another decade away.

This omission is disturbing. Dr. Gilbert's testimony, the pertinent sections of GAO's latest report on Clinch River and DOE's National Breeder Reactor Program Rationale and Clinch River Project Facts, and the Washington Post article on the need for an additional military production reactor make it clear that a serious fueling problem exists. Mr. President, I ask that the texts of these materials be entered into the Record.

The material follows:

Statement of Dr. F. Charles Gilbert, Acting Deputy Assistant Secretary for Nuclear Materials, Department of Energy, made before Hearings on H.R. 2969, Department of Energy Authorization Legislation (National Security Programs) for Fiscal Year 1982 before the Procurement and Military Nuclear Systems Subcommittee of the Committee on Arms Service, House of Representatives, Ninety-Seventh Congress, First Session, March 2, 4, 5, and 9, 1981 (H.A.S. No. 97-2), p. 156.

". . . Fuel-grade plutonium is required for blending with higher purity plutonium to produce more weapon-grade material, for the breeder program including the Clinch River Breeder Reactor (CRBR), and for basic research and development programs, primarily the Fast Flux Test Facility. A potential fuel-grade plutonium shortage may occur in the late 1980s based on the current projected supply and demand situation. As indicated in the chart, even with the Purex plant processing of plutonium from N Reactor fuel, DOE would not have sufficient supplies of fuel-grade plutonium required to support all these programs. The CRBR requirements shown in the chart are based on startup of the reactor in 1988. If that schedule is to be maintained, it will be necessary either to decrease requirements for the other two noted programs or to attempt to find an alternative source of plutonium."

Analysis of the Department of Energy's Clinch River Breeder Reactor Cost Estimate

COST AND SOURCE OF PLUTONIUM UNCERTAIN

DOE's Office of Nuclear Material Production, which is under the Assistant Secretary for Defense Programs, is responsible for meeting the Government's plutonium requirements. Defense program officials are unable at this time to identify the specific source or cost of plutonium needed to fuel the CRBR's demonstration operations. Instead, these officials believe that, based on the current CRBR schedule with initial criticality in September 1989, a decision on the source of plutonium for the CRBR will not be required until 1986. At that time, they expect to have definitive plutonium cost estimates.

DOE's defense programs officials said that the plutonium needed for the CRBR can be provided from a number of different sources, including defense programs activities, reprocessed light-water reactor spent fuel, and/or foreign sources. According to these officials, the costs associated with each of these sources not only vary widely, but also in some cases, are highly speculative.

Currently, the only domestic source of plutonium is from DOE's defense programs activities—either existing plutonium inventories, future production, or a combination of both. Depending on whether the plutonium is taken from existing inventories or from production, the value of the plutonium needed for the 5-year CRBR demonstration could range from $143 million to $1.2 billion.

Defense program officials point out, however, that they expect the quantity of plutonium supplied the CRBR will eventually be returned to the defense program. In their view, the only cost to the Government and CRBR would be the cost associated with reprocessing the spent fuel assemblies as the necessary step in recovering the plutonium. Based on defense programs officials' estimates, such reprocessing would cost from $196 million to $261 million for the 5-year demonstration period.

This approach does not recognize that a provision in the NRC Authorization Bill for fiscal year 1982 and 1983 (H.R. 2330), now under consideration by the House-Senate Joint Conference Committee, might have a substantial impact on the planned transfer of plutonium produced by the CRBR to defense program uses. This bill would prohibit the use of plutonium from NRC-licensed facilities in the manufacture of nuclear explosives. CRBR will be an NRC-licensed facility. Defense program officials feel, however, that this provision will have little impact on the return of defense-supplied plutonium. They believe that if the fuel supplied to CRBR was produced at a defense facility, the fuel returned from CRBR still should be considered as plutonium produced at a defense facility. We have not, as part of this review, analyzed the legality of DOE's position concerning the return of CRBR plutonium for defense purposes.

According to defense program officials, the plutonium for CRBR could also be obtained from reprocessed light-water reactor spent fuel assemblies. These officials estimate that plutonium obtained this way could range in cost from $15 per gram to $35 per gram. That cost range, however, is extremely speculative. It is based on DOE's preliminary estimates of prices they think could be negotiated for domestic reprocessing services.

In this regard, a commercial capability to reprocess light water reactor spent fuel does not now exist in this country. Although several reprocessing facilities are being considered, no decision has been made, and it is unclear whether those facilities could be available to meet the CRBR project schedule and plutonium requirements. DOE's existing defense program reprocessing facilities cannot recover plutonium from breeder fuel assemblies because of physical and chemical process limitations. DOE has requested $5.6 million for conceptual design efforts to modify one of its reprocessing facilities to enable it to reprocess spent fuel from light water reactors, the Fast Flux Test Facility[1] and the CRBR. DOE's preliminary estimates indicate the modification could be operational by fiscal year 1989 if the project is authorized by the Congress.

Another option under consideration includes a demonstration size fuel reprocessing facility. DOE's Consolidated Fuel Reprocessing Program is a comprehensive, centrally managed program for all U.S. fuel reprocessing research and development. According to DOE's Director of Nuclear Research and Development, Oak Ridge Operations Office, since 1976, the focal project for reprocessing research and development has been DOE's "Hot Experimental Facility." In June 1981, a conceptual design study for the Hot Experimental Facility was completed. This facility, however, does not have congressional authorization nor has it received construction funding. The Director estimates it would require about 10 years from start of construction to achieve normal operations.

[From the Washington Post, Nov. 20, 1982]

New Atom Plant for Weapons Material Urged

(By Milton R. Benjamin)

A Department of Energy advisory panel has recommended construction of a $4 billion nuclear reactor at the Savannah River Plant in South Carolina to produce the tritum needed to increase the nation's stockpile of hydrogen warheads, it was learned yesterday.

The proposed government plant—a larger, higher-powered version of existing reactors at Savannah River that produce all the plutonium and tritum used in America's nuclear weapons—would be the first new reactor built for the U.S. military program in more than two decades.

The advisory panel, which submitted its classified report Monday to Energy Secretary Donald P. Hodel, said that after evaluating the adequacy of future supplies of tritium and plutonium, it agreed with earlier studies that concluded a new production reactor is needed "to assure an adequate supply of strategic nuclear materials in the

1990s and beyond."

The increased need for tritium, a radioactive gas used in thermonuclear weapons, stems in part from U.S. plans to build thousands of new warheads for the MX, Trident and cruise missiles. It also is needed for the neutron warheads that will replace older tactical atomic warheads. In addition, because the isotope decays, the tritium in existing warheads periodically must be replenished.

Hodel, whose department is in charge of all of the facilities that produce materials for nuclear weapons, is expected to act on the panel's recommendation by March 1, an Energy Department spokesman said yesterday.

If Hodel approves the recommendation, funds for initial planning would be added to the Energy Department's fiscal 1984 budget request, a source said. If funds are approved, construction of the reactor would begin in 1985.

In recommending construction of the ZEPHWR (zero electric power heavy-water reactor) at the Savannah River Plant, the special advisory panel headed by former atomic energy commissioner T. Keith Glennan passed over all six reactor types and three alternative sites that had been proposed by the Energy Department.

These included a proposal that the Energy Department take over a partially completed commercial atomic power plant in Washington, where the utility spent $804 million before terminating construction, and convert this reactor to the production of plutonium and tritium.

The panel said it decided this proposal involving the Washington Public Power Supply System (WPPSS) reactor was the least desirable because of "the potential for adverse public perception of converting a plant designed for commercial production of electricity to production of weapons material."

The advisory group also cited concern "over use of commercial technology to produce weapons material" in strongly advising against construction of a pressurized light-water reactor that would be virtually identical to many of the atomic power plants operating in this country and overseas.

The panel also rejected the option of constructing the new tritium production reactor at the Nevada nuclear weapons test site, noting that the underground test conducted there raised "safety questions" involving earthquakes.

Glennan said in a telephone interview yesterday the panel felt constructing a new reactor similar to those that have been operating at the Savannah River Plant since the 1950s was the best way to meet the objective of producing needed materials on a timely basis.

"Essentially, you have a reactor that has been proven over many, many years, and the Savannah River Plant is operated by an enormously reliable contractor, Du Pont," Glennan said. "Those factors played a major part in our decision."

Of the five production reactors built by Du Pont at the Savannah River Plant in the 1950s, three produce plutonium and tritium for the weapons program, and a fourth—which was shut down in 1968—is being refurbished and is scheduled to be put back into operation next September. The fifth was shut down in 1964, and there are no plans to reactivate it.

The panel said if the administration decided it was essential that the new production reactor generate as a byproduct electricity that could be sold to a local utility, it still would recommend that such a plant be built at the Savannah River Plant site and that it be similar to the reactors already operating there.

The group said if the administration felt it was "essential" that the nation's entire production of tritium for hydrogen warheads not be concentrated at one location, it would recommend that a replacement for the aging N-reactor be built at Hanford, Wash.

The Hanford Reservation was the site of all the plutonium production for America's atomic weapons program during the 1940s. At one point, nine production reactors were operating there. But all have been shut down for over a decade except for the N-reactor, which in recent years has been largely used to produce fuel-grade plutonium for the Energy Department's breeder research program.

NATIONAL BREEDER REACTOR PROGRAM RATIONALE AND CLINCH RIVER PROJECT FACTS

CLINCH RIVER FUEL

The Clinch River fuel is a mixture of the oxides of uranium and plutonium. The uranium and plutonium required for fuel for the Clinch River project is to be supplied by the Department of Energy (DOE).

The uranium will come from the depleted uranium in DOE's stockpiles. This depleted uranium is the waste from the enrichment process: natural uranium contains 0.7 percent uranium-235, which is enriched leaving the depleted uranium. DOE currently has 24,000 cylinders, each containing 10 to 14 tons of depleted uranium, in storage at various locations.

DOE's Defense Programs is responsible for meeting the Government plutonium requirements. That office has traditionally provided plutonium at no charge to DOE's breeder program. The CRBRP currently plans to obtain plutonium from DOE's stockpiles. The amount of plutonium that will be used as fuel in Clinch River during the 5-year demonstration period is about 5.2 million grams of plutonium. This plutonium will be drawn from DOE's stockpile between 1987 and 1993. Because there will not be any net loss of plutonium and because DOE will retain possession of the plutonium, it is inappropriate to include plutonium as an element of the cost estimate.

The Clinch River powerplant will produce about 430 kilograms of plutonium more than it uses during the 5-year demonstration period. However, DOE has not elected to take credit for the value of this plutonium in the Clinch River cost estimate.

There are no firm plans at this time with respect to reprocessing Clinch River fuel assemblies. A number of alternative possibilities are being considered including the Demonstration Reprocessing Plant. ●

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[1] The Fast Flux Test Facility is the LMFBR test reactor built for testing fuels, materials, and components. It has no capability of generating electricity nor is it intended to demonstrate the breeding of plutonium fuel.

United States of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, WEDNESDAY, FEBRUARY 23, 1983 No. 19

Senate

CLINCH RIVER—STILL OUT OF FUEL

● Mr. HUMPHREY. Mr. President, on December 21 of last year I entered material into the RECORD substantiating the Department of Energy's (DOE's) own projections that it would probably run short of fuel-grade plutonium to fuel the Clinch River breeder reactor. Today I would like to return to this topic. New evidence has surfaced that corroborates my fear that we are building a reactor that we will not be able to fuel.

As I noted before in the RECORD on December 21, DOE's own Deputy Assistant Secretary for Nuclear Materials, Dr. F. Charles Gilbert, believes DOE will not have enough fuel-grade plutonium by the late 1980's to meet projected requirements for weapons blending, fueling the Fast Flux Test Facility and the Clinch River breeder reactor project.

The General Accounting Office (GAO) is also troubled by DOE's fueling plans. In their final report on Clinch River's projected cost dated December 10, 1982, the GAO emphasized that the source and price of Clinch River's plutonium fuel were uncertain.

Recently, the White House Office of Science and Technology Policy announced that it would not attempt to purchase plutonium from the British. Finally, it was made clear at the latest annual meeting of the American Nuclear Society that the owners of the only commercial nuclear fuel reprocessing plant at Barnwell, S.C. (one of DOE's prospective sources of plutonium for Clinch River) do not now believe the plant can be completed in time to supply significant quantities of plutonium for the project's initial fueling in early 1987.

Mr. President, Nuclear Engineering International ran an article last October covering the White House Office of Science and Technology Policy's announcement concerning the purchase of British plutonium. The American Nuclear Society also printed an abstract of the presentation given last November concerning the start-up of the Barnwell Reprocessing Plant. I ask that these articles and a copy of a letter from myself and Senators COHEN, HART, BUMPERS, BOSCHWITZ, and TSONGAS to Secretary of Energy Hodel on the Clinch River fueling question be printed in the RECORD.

The material follows:

NO BRITISH PU FOR AMERICA

LONDON.—The United States' administration "will not countenance the use of civil plutonium for military needs" and it has abandoned all ideas of leasing or buying plutonium from Britain.

This was stated by Mr. John Marcum, assistant director, energy and natural resources, in the White House Office of Science and Technology in London last month. Speaking at the Uranium Institute's annual symposium, he said the plutonium from the Barnwell plant would be for the civil programme, especially the Clinch River breeder reactor and other advanced reactor needs.

Reaffirming the administration's strong support for commercial reprocessing, he said that the new incentive for the private sector to re-invest in Barnwell would be for the government to provide a stable market by offering to purchase "a substantial amount" of its plutonium output. Contractual arrangements would also provide the private sector with assurances against further instabilities in domestic plutonium policies.

Mr. Marcum is reported by the *Financial Times* as saying that the US government was expecting to pay $20 to $30 per gramme for the plutonium separated from LWR spent fuel used by the US utility industry. At a conservative estimate the plant could process 1000t of spent fuel a year, which would yield up to 10t of plutonium. Thus the plant could earn about $250 million from plutonium alone, the government estimated.

Other incentives for private sector reprocessing would, Mr. Marcum said, be official encouragement of foreign participation, "both as customers and equity partners". Licensing would be made as rational and expeditious as possible.

In the meantime, there were no impediments to US utilities having their spent fuel reprocessed overseas. The new plutonium-use policy would also "provide a basis for long-term programmatic approval for advanced nations and allies to acquire reprocessing facilities on the basis of full safeguards and strong support for non-proliferation efforts".

The transfer of enrichment from the government to the private sector was, Mr. Marcum said, a longer-term objective. Initiatives would be developed in the months ahead to make the present operations more responsive to market conditions (see below), eventually facilitating commercial operation. This would help to provide a more stable market for the United States' troubled uranium mining industry, he said.

U.S. SENATE,
Washington, D.C., February 17, 1983.

Hon. DONALD P. HODEL,
Secretary of Energy,
Washington, D.C.

DEAR MR. SECRETARY: We are concerned over the Department of Energy's (DOE's) continued vagueness about the cost and source of plutonium fuel for the Clinch River Breeder Reactor project. As you know, late in 1981, Dr. Charles Gilbert, Deputy Assistant Secretary for Nuclear Materials, publicly testified that a shortfall in plutonium would occur by the end of the decade unless projected plutonium requirements are reduced or a new source of plutonium established.

Since then, we have learned that the L-reactor at Savannah River may not start operating until Spring, 1985. The DOE originally expected it to begin operating by October, 1983. We also have learned that a special DOE advisory panel recently urged the DOE to build a new materials production reactor to secure plutonium supplies for the 1990's. Because construction probably will not begin before 1985, the plant may not be completed until 1995, or later.

To stay within current cost estimates, however, the Clinch River Breeder Reactor will require substantial amounts of plutonium fuel by 1987.

Also, the White House Office of Science and Technology recently announced that the U.S. has abandoned efforts to lease or buy plutonium from Great Britain.

Finally, we have learned the nuclear industry does not now believe the commercial reprocessing plant at Barnwell, South Carolina, will be completed in time to produce significant quantities of plutonium before 1987. Given the nuclear industry's reluctance during the past two years to invest in the Barnwell plant, there is growing doubt that it will ever operate.

Because it could substantially affect the cost of the Clinch River Breeder Reactor, we would like to know when, and from what sources, the DOE intends to obtain the plutonium fuel.

We have included a copy of the General Accounting Office's recent critique of the DOE's official position on this matter. We would appreciate your addressing this critique in your answer, which we look forward to receiving before the end of March.

With warm regards, we are
Sincerely yours,
DALE BUMPERS.
GARY HART.
PAUL E. TSONGAS.
GORDON J. HUMPHREY.
WILLIAM S. COHEN.
RUDY BOSCHWITZ.
U.S. Senators.

[From Transactions of the American Nuclear Society, Nov. 14-18, 1982, Vol. 43]

STATUS OF THE BARNWELL NUCLEAR FUEL PLANT

(A. K. Williams, J. A. Buckham, W. B. Sumner, R. J. Cholister (AGNS), invited)

During the 1960s and early 1970s, the processing of spent fuel from the U.S. light water reactors (LWRs) was expected to become a logical extension of the nuclear industry as commercial nuclear power became established. By the mid-1970s, however, several impediments had emerged that caused the commercial market for reprocessing and related services to deteriorate. Licensing requirements, instead of becoming firmly established, became less definitive. In addition, concern for proliferation of nuclear weapons through use of plutonium from power reactors has complicated efforts to get reprocessing of commercial fuels moving again.

It now appears that reprocessing of LWR fuel may occur not as a purely commercial venture, but one in which the government plays some as yet undefined role. This role is expected to include both incentives for providing reprocessing services and guarantees in the event there is another abrupt change in governmental policy.

The needs for reprocessing LWR fuel include the following:

1. Relief for the problem of on-site nuclear fuel storage;
2. Preparation of the waste products in spent fuel for final disposal;
3. Initial plutonium supply for the U.S. breeder development program;
4. Development of LWR reprocessing technology as a logical basis from which to develop the reprocessing of breeder reactor fuel.

The use of the Barnwell Nuclear Fuel Plant (BNFP) represents the only near-term possibility for providing the necessary services to satisfy these needs. However, it should be recognized that although existing facilities could be ready for operation at an earlier date, completion of the additional facilities needed for continued operation would dictate an earliest startup date of 1987. A schedule for startup of existing facilities, as well as for the new facilities, is shown in Fig. 1. The estimated cost for the additional facilities is $652 million and includes the following major components:

Estimated Capital Cost—Mid-1981

	Millions
1. Densified fuel storage	23
2. Modifications to existing plant	34
3. Security-safeguards	61
4. Site/utilities/support facilities	68
5. Pu nitrate conversion	154
6. On-site waste management	312
Total	652

If krypton recovery is required, additional costs of $80 to $100 million can be expected. The estimated annual operating costs for the existing and additional facilities at the BNFP at equilibrium conditions are approximately $107 million, and would involve a staff of ~1600 people. In the event fuel fabrication facilities are also included at the BNFP, the operating staff would increase significantly.

The major facilities that have been completed at BNFP are fuel storage, separations, and uranium hexafluoride conversion. The fuel storage and separations facilities have been utilized in various U.S. Department of Energy (DOE) funded research and development activities related to fuel storage, proliferation-resistant fuel cycles, and testing of advanced safeguards concepts. Results of these activities have been reported elsewhere. Checkout of the UF_6 facility was terminated, and the facility has been maintained in a standby condition since 1977.

The operability of the separations facility has received some attention in the past few months because of the maintenance concept that utilizes a hybrid of both remote and contact maintenance. This concept is expected to provide continuous service with minimum maintenance. The contact maintenance concept includes the use of gravity flow, no moving parts, and high-quality, high-integrity plant components and facilities, designed and built to last many years with no maintenance.

During early checkout activities and in subsequent experimental runs, several items were identified as needing corrective action prior to hot startup. These include such items as relocation of the disposal system for degraded solvent, adjustments to the air lift system to improve hydraulics, and upgrade of plant instrumentation. In addition, deposits of phosphates, silica, and normal corrosion products were found throughout the process equipment during the early tests, sources of which were identified. To conserve uranium and acid values, cold testing utilized the recycle mode, which resulted in accumulation of solids. Some titanium corrosion was also observed in the acid fractionator, but was found to occur prior to 1980. The reasons for abnormal corrosion have been postulated and will be confirmed in future tests. Abnormal corrosion rates have not been detected from the 1980 and 1981 experimental runs.

In conclusion, the BNFP can be considered an operable and licensable reprocessing plant, and it can be used to support not only LWR programs, but also the national waste program and the breeder program. The startup date for Barnwell is contingent on pulling together an organization that can provide the capital for the needed additional facilities. This organization will require governmental guarantees with respect to changes in licensing criteria and nonproliferation policy.●

Reprocessing: The Next Step?

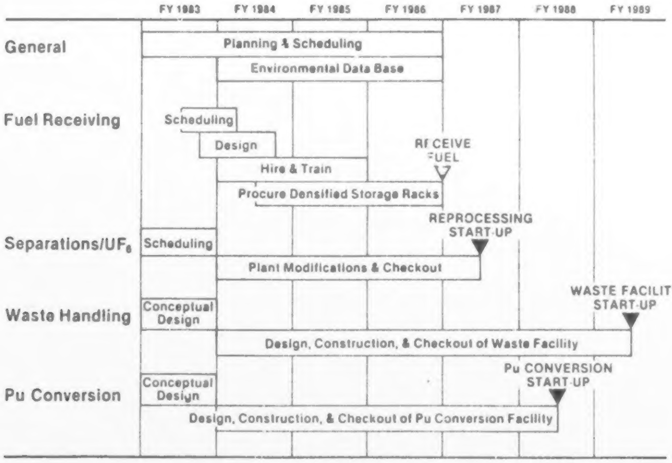

Fig 1 BNFP startup schedule

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Senate

CLINCH RIVER—NOW INDUSTRY IS SAYING NO

● Mr. HUMPHREY. Mr. President, for the last 2 years I have argued against further Federal support of construction of the Clinch River breeder reactor project. Throughout this period I have emphasized just how economically foolish it is for the Department of Energy (DOE) to spend money to commercialize breeder reactor technology now. I have always believed that spending so much on such a premature effort was counterproductive—that it would serve to distract the nuclear industry from its real problems and opportunities, which lie with conventional reactors.

Now the nuclear industry is starting to agree. In its most recent issue, Nuclear Engineering International concluded that the current pace of breeder development was no longer justifiable. This journal is the most popular and respected of international nuclear trade publications and previously has been a staunch supporter of breeder reactor development. Yet, in its leading comment page, the journal concluded that national efforts to build large-scale breeder projects such as Clinch River are "premature and can damage the prospects for the acceptance of nuclear technology." The journal went on to explain that:

> The United States has the least need for fast reactors (and is spending the most on them) and it is difficult to see any economic or technical justification now for proceeding with Clinch River. . . . The utilities and the vendors in the United States, as elsewhere, are putting little or none of their own money into the fast reactor. The push is coming from the scientists in the national research establishment, the existence of which is at stake.

The U.S. nuclear industry apparently agrees. In the latest issue of Nucleonics Week, the lead article, "CRBR Supporter Says Utilities Won't Put More Money into Project," details the difficulty DOE faces in gaining additional financial support for Clinch River.

Both of these articles are important reading as the Congress faces the task of bringing the Federal budget back into balance. I ask that they be printed in the RECORD.

The articles follow:

[From Nucleonics Week, Feb. 24, 1983]

CRBR SUPPORTER SAYS UTILITIES WON'T PUT MORE MONEY INTO PROJECT

The issue of utilities putting more money into the Clinch River Breeder Reactor is dead, an official who is one of the project's main supporters tells Nucleonics Week. The possibility further complicates efforts to find ways to take CRBR off the federal budget cycle and put it on a private funding footing. A utility task force examining the alternatives is considering the possibility of selling the project's electricity production, after the plant's five-year demonstration period, to DOE to power its gaseous diffusion plants, although there are problems with that idea.

Most of the ideas the task force is looking at involve capitalizing on the plant's commercial value after its demonstration period. In particular, the task force is looking at indirect loan guarantees, a DOE official said, guaranteeing on-time completion, performance and operation of the project at a reasonable cost.

One problem involved with the sale of CRBR's electricity to DOE for its diffusion plants is the existence of take-or-pay contracts DOE had already signed with Tennessee Valley Authority for electricity to run those plants. Additionally, the enrichment plant most likely to be powered by the CRBR is the first one DOE has been expected to shut down once the gas centrifuge enrichment plant at Portsmouth, Ohio, goes into operation.

Another problem the task force may face is that in taking the project out of the federal budget, fuel costs will be significantly increased. DOE has always counted on obtaining fuel for the breeder from government stockpiles, with no charge levied against CRBR since it was all part of the government. But if the project is placed on a commercial basis, the entire fuel cycle cost would have to be charged against it, Shelby Brewer, DOE assistant secretary for nuclear energy, admitted to a congressional subcommittee this week. The General Accounting Office, Congress' financial arm, has estimated fuel costs for the 25-year CRBR life span after the five-year initial period would be about $5-billion.

DOE officials have made clear that while they would like to continue to fund CRBR, they don't expect to get any more money from Congress if private industry doesn't increase its support, possibly to as much as $1-billion. Industry was originally supposed to pay half the cost of CRBR when it was estimated at $700-million. Now it is estimated to cost $3.3-billion and utilities are contributing $338-million. Increased utility or vendor contributions and/or foreign government participation are being eyed as ways of raising funds to complete the project, as are federal loan guarantees, performance guarantees and tax incentives. The final DOE recommendation may include a mix of options.

The project faces tough sledding in Congress this year. Last year the House pulled funding for it from the continuing resolution that is financing DOE's fiscal 1983 operations. The Senate restored funding, but the compromise conference report set aside $1-million for DOE to come up with a report on funding alternatives by March 15. Whatever DOE comes up with, however, will probably be the beginning of the debate. An industry source says the existing task force primarily is being handled by the utilities, and vendors and general industry will probably have some ideas of their own to propose. The Edison Electric Institute testified before a Congressional subcommittee on behalf of the project this week but made no reference to increased funding by utilities.—*Frances Seghers, Washington, and James Branscome, Knoxville.*

[From Nuclear Engineering International, February 1983]

FACING FACTS ON FAST REACTORS

(By Richard Masters)

The large amounts of money being spent world-wide by the nuclear industry on the development of fast breeder reactors is becoming increasingly difficult to justify.

Is this continuing level of expenditure appropriate if one takes a rational view of future trends in energy demand and fuel supply? Will it ever be possible to recoup the vast sums that have been spent and the much greater sums that will need to be spent before the fast reactor can become a commercial option for electricity utilities?

The present nationalistic and quasicommercial approach to the development of the fast reactor in many countries is premature and can damage the prospects for the acceptance of nuclear technology. Serious reappraisal is needed of national expenditures on fast reactor R.&D. and measures are urgent to bring about effective savings and improved results through international cooperation.

It is not enough to compare the production costs of one kilowatthour from an FBR with those from an IWR. This ignores all the other factors, including the time scale, involved in bringing FBRS into commercial operation. There should in each country be a systematic quantification of the costs of introducing FBRS and comparison with expected benefits, all discounted to an appropriate date with due allowance for the risks. Similar studies are also needed on an international scale. An international project does not automatically justify what does not make sense nationally.

For the past 30 years the conventional wisdom in the nuclear industry has been that fast breeder reactors will eventually take over the base load generation of electricity, at least in industrialized countries.

More generally the fast reactor has been seen as offering energy independence and a more than transitory existence to the nuclear industry.

The need to press ahead with the development and application of FBRS has been seen as urgent. In 1967 the IAEA predicted that "if only the current types of nuclear reactor continue to be built, then by 1980 all known reserves of low cost uranium would be committed." And some 10 years later the UK Atomic Energy Authority was confidently predicting an installed capacity of 33 GWe of breeder capacity in Britain by 2000, with a huge expansion to follow.

Even at that time serious independent observers of the industry in Britian were questioning whether the FBR could ever be economic and there has been growing acceptance that Britain cannot justify going it alone. How many countries can?

TIMESCALE

Every year the timescale gets longer and the economics more uncertain. The British Central Electricity Generating Board in its evidence to the Sizewell inquiry says it might need to order fast reactors in 25 years from now, but adds: "There is considerable uncertainly about this date: it could be somewhat earlier or perhaps considerably later." The Board's new chairman, Sir Walter Marshall, who as chairman of the UKAEA was until recently in charge of Britain's fast reactor programme, has said that the first truly commercial fast reactor with its fuel cycle could not possibly be operating in Britain until 2013 and in practice it was more likely to be commissioned a decade later.

Sir Walter believes it would be "irresponsible" to abandon a fast reactor programme but accepts that "in view of the demand for electricity and the fall in the price of uranium there is a strong a priori reason for saying that the right economic decision is to slow up."

Similar caution is evident in all other western countries with fast reactor programmes including France, where the utility Electricité de France is showing no enthusiasm for a "commerical" programme of fast reactors to follow Superphenix.

The United States has the least "need" for fast reactors (and is spending the most on them) and it is difficult to see any economic or technical justification now for proceeding with Clinch River. Unfortunately here as elsewhere arguments based on national prestige are brought to bear on what should be economic decisions. The utilities and vendors in the United States, as elsewhere, are putting little or none of their own money into the fast reactor. The push is coming from the scientists in the national research establishments, the existence of which is at stake.

The recent statement on fast reactors by the British government has the merit of recognizing the real position. The UKAEA, under its new chairman Sir Peter Hirsch, has been asked to draw up a development programme that is geared to the longer timescale for the likely introduction of FBRS and which takes account of the potential for securing the maximum benefits from international collaboration.

The timing is good. The Authority has an opportunity for taking a lead in specifying what a realistic r and d programme for keeping the fast reactor option open should consist of in present circumstances and how effective international co operation might be achieved. Britain could, for example, buy into Superphenix for operating experience and offer PFR at Dounreay as a test bed for components. It has unrivalled expertise on the FBR fuel cycle and also plutonium to contribute to an FBR club. In this way Britain's current r and d expenditure on fast reactors of £100 million a year could be reduced considerably. There is a precedent here in the approach by the AEA to expenditure on fusion which lead to the setting up of Jet.

Uranium will not be suddenly exhausted or become excessively expensive in the early years of the next century. There will be plenty of time to identify the trend and decide when it is worth ordering FBRS instead of thermal reactors. In any case there is scope for stretching out supplies by improving uranium utilisation in light water reactors and the introduction of reactors with better neutron economies.

But perhaps of greater significance to fast reactor economics than the availability of uranium is the fact that with advances in techniques for the storage of irradiated fuel from light water reactors utilities can avoid reprocessing. The uncertain and growing costs of reprocessing are then properly loaded on the fast reactor and with limited reprocessing there will be doubts about the availability of plutonium to fuel a large programme of fast reactors. In these circumstances the fast reactor may never be economic.

There still remains the strategic argument but the benefits must still be properly quantified and balanced against the premium it is worth paying for an insurance policy of fast reactors. At present it seems excessive. If the nuclear industry is to win support and acceptance for the fast reactor it will have to provide effective answers nationally and internationally. Evangelical fervour is not a substitute for sound technical and economic argument ●

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Senate

CLINCH RIVER—DREAM MACHINE

● Mr. **HUMPHREY**. Mr. President, in the April issue of the Atlantic Monthly, William Lanouette, an energy writer for the National Journal, wrote a definitive article on the breeder in the United States. The point of departure for this article is the Clinch River breeder reactor project and how such a costly and dated effort has not yet been killed in Congress. Mr. Lanouette's piece "Dream Machine", is balanced and puts this year's decision on continued funding of the Clinch River project into perspective.

Mr. President, I ask that this article be printed in the RECORD.

The article follows:

[From the Atlantic Monthly, April 1983]

DREAM MACHINE

(By William Lanouette)

The notion that you can cheat nature and gain something for nothing is as old as human ingenuity itself. Medieval alchemists sought a "philosopher's stone" that would transmute base metals into gold, and tinkering inventors have tried for centuries to make a perpetual-motion machine. All came to naught.

In a sense, the arrival of the nuclear age has not discouraged these ancient pursuits but intensified them. Since the 1940s, a new generation of dreamers and tinkerers—physicists, engineers, publicists, and politicians—has taken up the search, and at its urging, the federal govenment has committed more than $10 billion, thousands of careers, and nearly four decades to building nuclear-power plants that are supposed to make more fuel than they consume while generating electricity. This new "alchemist's dream," as its boosters have called it, is the breeder reactor. It represents the costliest energy-research project in U.S. history—one that survives despite accidents, delays, mismanagement, bitter scientific and political argument, and ever-rising costs. Last fall, Congress came close to withdrawing all funds for a breeder scheduled to be built beside the Clinch River, in Oak Ridge, Tennessee, and it may succeed in doing so this year. The Clinch River reactor, which would be the largest and most expensive American breeder ever built, has been the subject of controversy for more than ten years. How the project came to be and how it has survived serves as a revealing example of the way politics and nuclear energy have been intertwined.

A breeder reactor looks like other nuclear-power plants running today, and, like them, it can generate electricity, by splitting atoms to release heat to boil water to drive a steam generator. But the breeder entails an important difference: its special purpose is to convert otherwise useless metals into new atomic fuel. A nuclear plant that produces at least as much fuel as it consumes can legitimately be called a "breeder." Conventional reactors are not breeders, even though they produce some new fuel, because they produce much less than they consume.

If the breeder can be made to work as its promoters hope, it promises the United States an era of "endless energy." And, they say, the energy autarky this would bring could assure the nation's prosperity and political stability "essentially forever," or, if not quite forever, then at least "until the next Ice Age." There's a catch, however. The fuel that both breeders and conventional reactors make while generating electricity is plutonium—a toxic, man-made metal. Plutonium stays dangerously radioactive for millennia, and is the explosive element in most atomic bombs. Whereas a 1,000-megawatt conventional power reactor typically produces enough plutonium in a year to make about twenty bombs, a breeder reactor of the same size would produce enough to make as many as 100. (One megawatt is one million watts.) Thus, critics fear the huge stockpiles of plutonium that a fleet of breeders would produce. With tons of commercial plutonium in circulation, nations or terrorists would have relatively little trouble obtaining the few pounds needed to make a bomb.

These two extreme predictions underlie debates about the economic costs and benefits of breeders, although the mundane details are often the ones that arouse the passions of debaters. Deeper still are competing social and economic beliefs, such as growth versus no growth, or the inclination to produce rather than conserve energy. Seen broadly, the controversy over the breeder turns on the faith of the promoters that technology will be able to solve the social, political, and environmental problems it creates, and on the fear of the skeptics that the breeder's problems outweigh its promise. The fight expected in Congress this spring over whether or not to build the Clinch River breeder will be essentially a fight over these competing visions of reality.

The pursuit of the Clinch River breeder has acquired "a manic aspect," according to Victor Gilinsky, a member of the U.S. Nuclear Regulatory Commission (NRC). He says that engineers and utility executives see their quarrel with the breeder's critics as a "test" of their ability "to deal with a hysterical minority." He says that, in like fashion, government officials consider the struggle with anti-nuclear groups to be "an indicator of their ability to run the country." Carl Walske, the president of the Atomic Industrial Forum, Inc., the nuclear industry's trade association, views the breeder in still more personal terms than these. He says, "Telling a utility executive that he can't have a breeder is like telling a man he can't have grandchildren."

Last August, the NRC granted a preliminary permit for the Clinch River site to be leveled The builders began the job soon after—although as yet they have no guarantees that the NRC will rule the plant safe for the site or grant a construction permit—in hopes that Congress would then be reluctant to withdraw the project's funds. They sent crews in to clear 250 acres of trees, to move 1.6 million cubic yards of soil, and to excavate nearly a million cubic yards of rock. As of this writing, the NRC must still formally approve the site's preparation, so even this work is being done on a gamble.

If a breeder is ever built at Clinch River, it will be the fourth that American taxpayers have financed. The first, whose construction began in 1949, in Idaho, produced the first electricity generated by the atom. The second, begun near Detroit in 1956, as the "first commercial breeder," produced electricity so expensive that its owners have not bothered to calculate the cost. Both of these facilities suffered one of the worst malfunctions that can befall a nuclear plant: a partial meltdown of the radioactive, heat-producing core. The third breeder, begun in Idaho in 1957, has avoided meltdown and produced electricity for nineteen years, but it was designed only to test different breeder fuels, not to breed new fuel itself. Its relatively simple design, which has been adopted for larger reactors in France and the Soviet Union (countries whose breeder programs are years ahead of ours), so far has been rejected by planners for future plants here.

The Clinch River breeder is not the last to be proposed. This past October, the Electric Power Research Institute (EPRI), a research and development center run by a group of utilities, opened an office near Chicago to begin planning for a fifth breeder—two or three times bigger than the one proposed for the Clinch River site—to be built, they hope, with foreign money. Floyd Culler, the president of EPRI, says, "If the Clinch River breeder reactor is built and successful, the follow-on program is necessary as the next step toward a commercial product available some time after the year 2000. If [the Clinch River reactor] fails, it's equally necessary to sustain breeder development in the United States, because [the development has] no focal point without it."

What Culler's faith reveals, and what the breeder's supporters have shown, is that they need this dream machine, even if it does not work well, as a symbol of the atom's stubborn, ultimate reward. According to Gilinsky, "It promises endless energy, and once you're on to that, you see your way through to infinity."

The breeder has evolved from an intellectual marvel to a military adjunct to a commercial possibility to a political symbol. Reviewing the breeder's history, one can see more clearly how the atom has enraptured—or entrapped—scientists, politicians, and the rest of us.

The plutonium made by breeders is the first element created by man. It is useful to understand what plutonium is and how it is made, since the breeder is designed to make it by the ton. The element is derived from uranium (U), which is mined from rock and which, in its raw state, consists of about 99 percent U-238 (238 represents the number of neutrons and protons in a single atom) and less than one percent U-235. (Atoms are composed of positively charged protons and neutral neutrons, which together form an atom's nucleus, and negatively charged electrons, which spin around this nucleus.)

In a breeder reactor, a core of U-235 is surrounded by a blanket of U-238. Making plutonium is a three-step process, the first step of which is "fission." U-235 atoms are unstable, and when enough of them are concentrated in one place ("critical mass"), the neutrons of some of those atoms, which are routinely and randomly given off, will hit other atoms and split them in two, releasing some neutrons at the same time. If each neutron released strikes another atom, which then releases more neutrons, a "chain reaction" is created. When a U-235 atom fissions in the breeder reactor's core, one or more neutrons escape into the blanket, where they bombard atoms of U-238. Only a few elements will fission when a neutron strikes them, and U-235 is one; most, including U-238, absorb the escaped neutron instead, adding it to their own mass and weight. This "neutron absorption" is the second step in making plutonium. When a U-238 atom absorbs a neutron, it becomes U-239. So far, the process has taken a few millionths of a second. The third step, "radioactive decay," takes about three days, as the U-239 breaks down into neptunium-239 and, finally, plutonium-239. Once plutonium is made, it can replace U-235 as the breeder's core to fuel chain reactions. In fact, most breeders are designed to run on plutonium, not uranium.

Plutonium (Pu) wasn't known for certain to exist until February 23, 1941, when it was separated at the University of California at Berkeley by the chemist Glenn Seaborg, working with his colleagues Joseph Kennedy and Arthur Wahl. The discovery came in the midst of research elsewhere to design a nuclear weapon, and it had been predicted earlier.

First had come the work of Leo Szilard, a Hungarian-born physicist who had studied in Berlin under the physicist Albert Einstein and fled Germany in 1933. That year, he conceived the two essential requirements for the release of nuclear energy—critical mass and chain reaction—and he soon recognised his idea's potential for weaponry. In 1938, Szilard joined a research team at Columbia University that was headed by another immigrant, the Italian physicist Enrico Fermi. There, working with the Canadian physicist Walter Zinn, Szilard refined his theory and confirmed the uranium atom's explosive promise. (In 1939, Szilard and two other Hungarian immigrants, the physicists Eugene Wigner and Edward Teller, persuaded Einstein to sign a letter to President Franklin D. Roosevelt, urging him to develop nuclear weapons before the Germans did. The letter set in motion the Army's Manhattan Engineer District, commonly referred to as "the Manhattan Project"—the top-secret effort to make an atomic bomb.)

In 1940, the Columbia team discovered that when a U-235 atom fissions in natural uranium, at least one of its neutrons is absorbed by the non-fissionable U-238. Fermi and Szilard considered the absorption of little importance, but a physicist at Princeton University, Louis Turner, suggested that the U-238 might be transformed by the absorption into a new element, which, which might itself fission. Since U-238 is 140 times more plentiful in nature than U-235, Turner proposed that the transformation might be a means to create a more abundant supply of an explosive element for bombs. Turner's suggestion led Seaborg and his colleagues to try to separate such an element.

The Berkeley team bombarded natural uranium with neutrons in the university's cyclotron, or "atom smasher," and their chemical analyses of the result proved Turner's prediction that a new element would be created. A month later, together with the physicist Emilio Segre, they confirmed Turner's more important corollary: that the new element would fission as easily as U-235 does. This knowledge gave the United States a potential alternative to scarce U-235 for use in atomic bombs.

According to the late Robert E. Wilson, who helped to oversee the development of nuclear energy in the government in the early 1960s, "If there ever was an element that deserved a name associated with hell, it is plutonium. This is not only because of its use in atomic bombs—which certainly would amply qualify it—but also because of its fiendishly toxic properties, even in small amounts." According to Seaborg, "Wilson's indictment of its poisonous quality [is] almost an understatement," because a particle "the size of an ordinary speck of dust" can cause lung cancer when inhaled. When inhaled or swallowed, plutonium can deposit in bones, in the lymph nodes, and in the liver, causing tumors. It is so highly reactive that small chips and shavings of it can ignite; it emits radioactivity constantly, and must be stored in small pieces to prevent spontaneous chain reactions.

On December 2, 1942, when scientists on the Manhattan Project, working in a squash court under the stands of the University of Chicago's football field, used U-235 to create the world's first self-sustaining nuclear chain reaction, they showed in practical terms how the energy giving atoms their form and strength could be released at will. Once it was clear that a chain reaction could occur, the Manhattan Project scientists knew that an atomic bomb would probably work. Their task from then on was to make as much plutonium as possible, as quickly as they could. At least two technologies had potential to accomplish this goal: the watercooled reactor and the breeder.

According to Alvin Weinberg, a physicist on the Manhattan Project, who later became the director of the Oak Ridge National Laboratory, Szilard gave the breeder its name. The idea, however, was Turner's. Once he had figured out that uranium might be transformed into the new element that Seaborg later separated, he suggested that this transformation might be truly advantageous if *more* plutonium were produced than uranium was consumed. In a public lecture that Szilard gave in 1946, he said, "With this remark of Turner, a whole landscape of the future of atomic energy arose before our eyes in the spring of 1940, and from then on the struggle with ideas ceased and the struggle with the inertia of Man began." Szilard's observation demonstrates the Manhattan Project scientists' recognition that the breeder held promise as a power source even as they worked to develop its potential for weapons.

The work of the Manhattan Project scientists in the early 1940s had revealed that the neutrons released to split atoms behave differently at different speeds. A "fast" neutron moves at about one fortieth the speed of light, or 17 million miles an hour. If a neutron is slowed down, or "moderated," they discovered, it has a better chance of striking the nucleus of another atom. Such "slow" neutrons move at about 5,000 miles an hour, and, generally speaking, they are safer to work with and easier to control.

Plutonium can be made from uranium that is bombarded by either fast or slow neutrons. The Chicago scientists were intrigued by the possibility Turner had raised of using fast neutrons to "breed" more fissionable material than a reactor consumed as fuel, but they lacked confidence in their ability to work with a fast-neutron reactor, because they never had; most of their experiments had been with slow neutrons (the first chain reaction was accomplished in a slow-neutron reactor, for example). Moreover, a slow-neutron reactor can sustain a chain reaction using fuel low in U-235. Because such uranium was scarce, and because a fast-neutron reactor would demand much more of it, the scientists decided in the spring of 1943 in favor of the slow-neutron option. They called for reactors using water to moderate the speed of the neutrons and to cool the radioactive core—a strategy that is the basis for the design of conventional reactors today. (Other moderators that have been tried in experimental reactors since the war include graphite and beryllium, both of which slow neutrons down efficiently.)

Such power reactors are called "light-water" plants, because they use ordinary water as a moderator and coolant. "Heavy-water" reactors—using water whose hydrogen atom has an extra neutron, which doubles the atom's weight—have also been designed and built in the years since nuclear energy was first conceived. The advantage of heavy-water reactors is that the neutrons in their cores are less likely to be absorbed by the water, so that these reactors require even less U-235 than light-water plants do to sustain a chain reaction.

Water-cooled reactors do not bombard a blanket and transmute it into a new element, as breeders do. Instead, tubes containing U-235 diluted by U-238 stand in a core, through which water is pumped, together with "control rods" of non-fissionable material that absorbs the U-235's neutrons and prevents them from fissioning. When the control rods are withdrawn, the neutrons travel through the water to reach and split U-235 atoms in other tubes, and a chain reaction is created. The water circulating through the core carries off the chain reaction's heat and steam drives a turbine to make electricity. Because the non-fissionable U-238 in the tubes can absorb neutrons, some of it is transmuted into plutonium, as in a breeder reactor.

Plutonium in the spent fuel of the water-cooled plants designed only to generate electricity is an undesirable and hazardous by-product. But for the Manhattan Project scientists, plutonium was the goal. Because a breeder promised to make much more plutonium than the reactors feasible at the time could, theoretical work on one continued throughout the war.

Szilard was especially productive. In January of 1943, just five weeks after the first chain reaction had been accomplished, he gave a memorandum to Arthur Compton, the leader of the Manhattan Project's plutonium-making program, spelling out his specifications for a fast-neutron, plutonium-breeder reactor. His proposal was rejected, because slow-neutron non-breeders were already being planned. In April of 1944, Szilard again proposed a fast breeder, this one to be cooled by liquid bismuth or liquid sodium (two metals that conduct heat well but do not slow a neutron's speed as much as water), and he predicted that the machine could double its original consignment of fuel in four and a half years. But by then, huge slow-neutron, non-breeder reactors and chemical separation plants for the manufacture of plutonium had been built at Hanford, Washington, and a secret bomb-making facility in New Mexico—Los Alamos—was ready to receive the product. All the same, Szilard proposed still another fast breeder, in March of 1945, and predicted that this one could make ten tons of plutonium in three years, doubling its original complement of fuel in one year. In the decades since, the expected "doubling time"—the period required to make as much new fuel as a breeder reactor starts with—has stretched as breeders have actually operated: to five years during the 1950s, between seven and ten years in the 1960s, and at best between forty and fifty years today.

Although by the end of the war no breeder had been built, several schemes for one had evolved, using neutrons at different speeds. Szilard and Fermi favored fast-neutron, liquid-metal-cooled breeders, along the lines of the reactor Szilard had been suggesting—the design upon which the three American breeders and the proposed Clinch River plant are based.

Slow-neutron breeding is also theoretically possible, but much trickier to achieve. In a light-water breeder, the hydrogen in the water absorbs some neutrons, which are therefore lost to the chain reaction. To compensate, the fuel must be enriched with more fissionable material and the core itself must be more compact than in conventional power reactors. Even then breeding is only marginal. For this reason, the light-water breeder received little attention until the 1970s, when one was tested.

A different slow-neutron scheme, which Wigner conceived during the war, improved on the light-water format. Wigner suggested that a coolant other than water would avoid the problem of absorption. Weinberg studied molten salt's potential during the 1950s, and designed a molten-salt-cooled reactor as a precursor to a breeder in 1967. It was to use as fuel artificial U-233—a synthetic, fissionable element, which Seaborg discovered in 1941—rather than plutonium, and bombard thorium-232, turning it into more U-233. Unlike conventional reactors, whose fuel is solid and whose moderator is liquid, the molten-salt reactor's fuel was to be dissolved in the liquid salt and flow through the reactor across solid bars of graphite—the moderator—to bring about a chain reaction. The molten-salt breeder still appeals to many physicists, because it would use slow neutrons to convert a relatively abundant metal (thorium) into an element (U-233) that can fission about as well as the rare U-235 does. The design and engineering are simpler than for a uranium-to-plutonium breeder, and the radioactive core has about one tenth the fissionable material—a significant safety advantage. Thorium breeding has also been explored in a light-water-reactor design.

The nuclear physicist Theodore Taylor, a consultant at Princeton University, says, "Physicists seem to prefer the thorium breeder for its elegance and safety; engineers seem to prefer the plutonium breeder, because of its performance as a producer of fuel." Milton Shaw, an engineer, prefers plutonium breeders, and during his tenure in the 1960s and early 1970s as the director of reactor research at the Atomic Energy Commission (AEC), established by Congress in 1946, he systematically cut off development of alternatives. A small molten-salt non-breeder reactor (called Molten Salt Reactor Experiement, or MSRE, and nicknamed "Misery") was operated at Oak Ridge in the late 1960s, as part of research on an atomic-powered airplane, but it was abandoned in 1972. No molten-salt breeder has ever been built.

In 1946, the physicist Hans Bethe, of Cornell University, proposed a third scheme: a beryllium-moderated and sodium-cooled breeder of plutonium from U-238 that would slow neutrons to an intermediate speed. The General Electric Company built a reactor near Schenectady, New York, in the late 1940s, to test Bethe's design, but the reactor didn't work well, and in 1950 the AEC converted it for research on a sodium-coolded submarine reactor, of the type that later powered the U.S.S. Seawolf. (This submarine gave Jimmy Carter his first exposure to atomic energy. Perhaps his later aversion to it can be explained by the reactor's trouble containing the sodium—trouble so common that the ship was nicknamed "Twenty Thousand Leaks Under the Sea.")

Once the theoretical understanding of atomic physics was complete, the excitement and mysteries of science gave way to the more mundane problems of engineering. At that point, Szilard lost interest in breeders, and turned instead to microbiology. Until he died, in 1964, he worked also to control the spread of nuclear weapons. Other nuclear pioneers—Fermi, Zinn, Bethe, and, eventually, Teller—turned their interest in atomic power to finding peaceful uses for it: in medicine, in industrial research, and in the generation of electricity. Indeed, the quest to devise a constructive role for the atom, to compensate for its destructive potential, became, for some, a form of atonement—an act of faith. But the atom was stubborn. Early predictions of cars, trains, and planes powered by pint-sized reactors proved impossible to fulfill. The notion that nuclear energy would someday be "too cheap to meter" is, today, an ironic artifact of that hopeful era.

Of all the pioneers, Walter Zinn was perhaps the most determined to transfer the breeder from paper to concrete. After the war, he moved with Fermi from Columbia to the University of Chicago and, finally, to the Argonne National Laboratory, which was built outside of Chicago and opened in 1946.

Zinn became Argonne's first director, and under him reactor research flourished. First he tried to put on paper the visions of the breeder that had captivated Szilard, Fermi, and Wigner during the war. By 1947, he was convinced that he could build a successful breeder. The task seemed critical, given the continued scarcity of fissionable material and the increased demand for such material, as a result of the Defense Department's increased production of the MK-3 plutonium bomb, modeled after the "Fat Man" bomb dropped on Nagasaki.

The physicist J. Robert Oppenheimer, who had been the director of Los Alamos during the war, wrote a letter to the AEC's first chairman, David Lilienthal, in October of 1947, urging that "every assistance be given to the Argonne Laboratory to realise their plans as early as possible." His prestige helped Zinn's case, and the next month the commission approved construction of a fast-neutron breeder—the Experimental Breeder Reactor Number 1, or EBR-1. The reactor was to be cooled chiefly by liquid sodium and to use U-235 as fuel to convert U-238 to Pu-239. The AEC reported to Congress that the potential of breeders for both power-generation and bomb-making was an important reason for developing such reactors. The project's code name was Operation Bootstrap.

EBR-1 was aptly numbered. It was a machine of firsts: the first reactor authorized by the new Atomic Energy Commission; the first to generate electricity from atomic energy; the first to show that breeding new fuel was technically possible; the first to run on plutonium; and the first to have a core meltdown.

Delays and cost overruns—conspicuous features of every breeder since—plagued EBR-1. The commission was told that it would take eighteen months to build the plant. Instead it took two years just to complete the plans, with further delays resulting from the need to custom-make almost every piece of equipment. As the AEC's historian, Richard Hewlett, wrote later, in an unpublished chronicle of EBR-1: "It was not in the Olympian realms of the nuclear scientist that the obstacles were found but rather in the frustrating work-a-day world of the mechanic, the electrician, and the plumber."

Zinn and his staff wanted to build their breeder at Argonne, but the AEC's safety committee thought that the risk of an accidental explosion was too great, and recommended a less-populous site. It took until February of 1949 to find one—an artillery test-range near Arco, Idaho, on a lava-and-sand plateau by the Snake River—and six months more to approve it.

After all that trouble, Zinn's breeder was delayed once again. Just ten days after the AEC authorized the building of EBR-1 in Idaho, President Harry S. Truman announced that the Soviet Union had exploded an atomic bomb, an event that demanded the reappraisal of all reactor-development programs. Three things saved Zinn's breeder: although it required weapons-grade fuel (U-235) to run, it would also make such fuel (plutonium), and it could be finished in a short time, at a relatively modest cost of $3 million.

Zinn faced new problems once he moved west. His construction team lived about eighty miles from the site and had to drive to it each day. Winter storms hampered the pouring of concrete, and sand clogged some of the plant's delicate machinery.

The construction ended in the spring of 1951, and in June the crew loaded the fuel into the football-sized core, only to discover that Zinn's consignment of U-235 from the weapons stockpile—about ninety-three pounds—wasn't enough to start a chain reaction; more had to be shipped from Argonne. Finally, in August, the reactor was able to sustain a chain reaction. Then, on December 20, Zinn and his crew slowly raised the reactor's power level and hooked the machine up to a generator. Zinn wrote in the control-room log book that day, "Electricity flows from atomic energy."

The next day, Zinn's crew spent hours tinkering with the reactor to keep it from shutting down—"scramming"—whenever the power level was raised. When the machine finally stayed on and was hooked up to a generator, it supplied power for the whole building. Some of the machinists turned out small brass knobs, as souvenirs, on their lathes. Zinn made one too. They were the first mechanical products of the atomic age. Zinn sent a telegram to the AEC's director of reactor development, in Washington. Security demanded that his message be cryptic: "Our boy started his journey today. All is well. He was able to undertake the trip without assistance. Merry Xmas." The AEC announced the achievement on December 29.

In June of 1953, EBR-1 proved that breeding was technically possible, when chemists separated a few milligrams of plutonium from the fuel—not much, but Gordon Dean, the new chairman of the AEC, made the most of it, announcing that breeding had been acieved. By then, power had begun to replace weaponry as the reactor's chief goal, and Dean warned that breeding was so far a slow and difficult process, which might be too expensive to be adapted directly for commercial power. The "real significance," he said, was that the breeder could transform naturally abundant U-238 into fuel for other kinds of power reactors.

The AEC wasn't as quick to announce what happened at EBR-1 on November 29, 1955, when the reactor crew tested the radioactive core's ability to run with less sodium coolant. they discovered it couldn't. When the chain reaction surged rapidly, the supervisor told the operator to "scram" the reactor, but the operator didn't hear, having just taken a call from his wife on the control-room telephone. The supervisor leaped over a table in the control room and hit the scram button, but he was two seconds too late. The core overheated and more than half the fuel melted, blowing radioactive gas out of the building. No one inside was harmed, but it took two years to decontaminate the core and clean out the mangled fuel.

Zinn had opposed the core-heating tests of EBR-1, but had been overruled by his superiors at the AEC. The day after the reactor's meltdown, he called Washington to report the bad news. As he recalls his message, it was, like he coded telegram, brief but portentous: "Well, fellas, it's happened. Nobody's hurt, as far as we can tell. But remember, I told you so."

After EBR-1, Zinn built another reactor at the Idaho test site—EBR-2, which is the most successful breeder in the U.S. to date. For EBR-2, Zinn submerged the main components in a sealed pool of sodium coolant, and this strategy has proved to be simpler and safer than EBR-1's loops of pipe.

EBR-2 is a breeder that does not breed. It has been used instead to generate electricity, test various breeder cores, and demonstrate that plutonium made in a fast-neutron reactor can be recovered and refabricated as new fuel. Its success is measured chiefly by its longevity. Although EBR-2, like other sodium-cooled breeders, has been prone to fires, none has been serious, and the reactor has run almost continuously since it was started up, in 1964. Nevertheless, its design has been rejected by American planners, though other countries have employed it with relatively good results.

Breeder cores have grown steadily since the 114-pound, football-sized one that melted in EBR-1. The core of EBR-2 weighs 510 pounds, and is the size of the glass jug on an office water-cooler. In the first commercial breeder, Fermi-1, whose fuel also suffered a partial meltdown, the 1,000-pound core is the size of a fifty-five-gallon drum. And if the Clinch River breeder is built, its core will weigh 11 tons and be the size of a hotwater heater. The cores of future breeders will be even larger, perhaps weighing 50 tons. The fuel in a breeder core is "fundamentally explosive," Wigner has said; "I don't like the idea of having thousands of pounds of plutonium at one place."

What worries Wigner and many other physicists is that in large reactors, the plutonium may melt and compact into clusters that can form new critical masses—perhaps setting off small atomic explosions. In water-cooled, nonbreeder reactors like the one at Three Mile Island, whose fuel is only about 3 percent fissionable U-235, the neutrons are slowed to increase their chances of fissioning other U-235 atoms, thus maintaining the chain reaction. Loss of the coolant speeds up the neutrons, with the result that they fission fewer atoms and the chain reaction slows down. But in the breeder, whose core is about 15 percent U-235 or Pu-239, the challenge is not to encourage a chain reaction but to control it. So many fissionable atoms are packed together that the probability that a neutron will hit one and split it is extremely high from the start. Sodium coolant absorbs the heat given off by the rapid chain reaction and keeps the core's temperature stable. If the coolant boiled away, the temperature would rise within a few millionths of a second and the fuel would melt. The AEC and its successors have called this a "hypothetical core-disruptive accident," or HCDA—jargon that has the effect of minimizing what may be a fatal flaw in breeder technology.

Hans Bethe has postulated that if an atomic explosion occurred in a breeder, its force would equal a few hundred pounds of TNT, rather than the kilotons and megatons released in a planned nuclear explosion. He says, "I think this [explosive force] can be contained in the reactor vessel. But those who have studied this problem don't say [the vessel will never be breached], and I wish they could."

The HCDA is not an explosion of the reactor itself, which would level the landscape with a blast and fireball. Instead, it refers to small atomic explosions inside the reactor, which could rip apart the steel vessel surrounding the core and its coolant. The explosions would spew lethal radioactive gases and debris into a large building that is designed to contain just such a surge. But if the pressure became too great, or the wrong valves were opened in the confusion of an accident, as has happened at other plants, these deadly gases could escape into the atmosphere, perhaps killing thousands of people downwind and contaminating the soil and groundwater for generations.

This is considered a "worst-case scenario" by nuclear-safety experts—one that has a very slight probability. But the risk is serious enough that it helped to delay for a number of years the construction of Fermi-1, in Michigan. The HCDA is an issue that members of the Nuclear Regulatory Commission have yet to consider as they decide whether or not to approve construction of the Clinch River breeder.

When Walker Cisler talks about his many trips to Russia, one event stands out: a bath he took at a guest house in the Urals. "It was beautiful," he recalled recently. "I had a bathtub full of hot water heated by the BN-600—heated by the atom, heated by a breeder." Cisler would love to bathe at his home, in Grosse Pointe Park, Michigan, in water heated by a breeder, and as the president and, later, the chairman of the board (now retired) of the Detroit Edison Company, he worked to build and run the Fermi breeder.

The plant cost more than $140 million and generated what is doubtless the most expensive privately produced electricity in the U.S. history. "We never figured it out—on purpose," a company spokeswoman says.

Cisler formally proposed building the Fermi fast breeder in 1955. Two years earlier, he had declared: "We do not expect any appropriations of public money to our project." In the end, however, with his pride in free enterprise shattered by lengthy and expensive construction delays, design and operating errors, a costly and dangerous partial core-melt, and repeated accidents with the breeder's sodium coolant, Cisler did ask the federal government for money to keep his plant running, and he is still bitter that he was refused. "He dreamed the impossible dream, and it was just that: impossible," a local businessman later told a writer for the Detroit Free Press.

Cisler, a veteran of the War Production Board during World War II, joined Detroit Edison in 1945. He says that having seen "the industrial strength of our country focused on a single purpose" in wartime, he hoped that the country's industrial strength would be focused anew after the war, on commercial uses of the atom. The managers of Detroit Edison had themselves been eager for atomic power since 1940, when Alex Dow, who was then Detroit Edison's president, ordered a study of the energy potential in uranium. The utility's annual report for 1945 asserted, "If and when atomic energy is applied to power production, we hope to be among the first to take advantage of it." The AEC's Industrial Advisory Group, of which Cisler was a member, recommended in 1948 that classified nuclear technology be shared with private industry.

The utilities came to regard making plutonium along with electricity as a new way to express their patriotism during the Cold War. They lobbied hard to amend the Atomic Energy Act of 1946 to allow the utilities to sell nuclear power and forbid the government from doing so. (Because power made incidentally at the government's plutonium production or research facilities could be sold, as the act was amended in 1954, the Clinch River breeder, whose chief purpose is research, complies with the law.) President Eisenhower had declared an "Atoms for Peace" program, and many companies were enthusiastic about joining Detroit Edison to build a breeder. In 1955, twenty-five electric utilities, four engineering and construction firms, and four manufacturers formed Atomic Power Development Associates (APDA). The new group then sent the AEC a proposal for a 100-megawatt fast breeder, which would sell steam to Detroit Edison, the principal partner, and plutonium to the federal government.

Lewis Strauss, a Wall street financier who shared Cisler's faith in private industry, was the chairman of the AEC and an informal adviser to Eisenhower at the time. Strauss announced the Fermi project at the first UN conference on peaceful uses of the atom—an announcement that he hoped would upstage the Soviet Union's plans to build a breeder. For Strauss and Cisler, just as Cold War ideology defined the pursuit of the breeder as a race, so free-market values dictated that building the breeder should be a private endeavor. Indeed, to this day, the breeder's promise of ideological advantage and business profits from both domestic and foreign markets has sustained the promoter's faith in the technology and buttressed their pitch to Congress and the public, despite rising opposition and almost routine mechanical failures.

The Democratic Senator Albert Gore, of Tennessee, challenged the wisdom of the 1954 amendments and introduced a bill to change them, in order to allow the federal government to build and run six nuclear plants. Cisler and Strauss both testified against the bill; in doing so, they angered another senator, Clinton P. Anderson, of New Mexico, who was the chairman of the Joint Committee on Atomic Energy and a Democrat who favored a wider federal role in generating and selling nulear power.

Gore's bill did not pass the House, but Anderson and Strauss clashed again, in 1956, over the Fermi breeder's construction permit. The AEC's Advisory Committee on Reactor Safeguards, a panel of engineers and scientists, was required to review such permit applications but did not have to publish its findings. The advisory committee had reported to the AEC that "there is insufficient information available at this time to give assurance that the [Fermi breeder] can be operated at this site without public hazard." The advisory committee also doubted that federal safety research then under way would serve to diminish the risk before the plant began to operate. Anderson demanded the report's release, and Strauss was slow to comply. Two weeks after the report was finally made public, the AEC, ignoring the warnings of its advisers, voted three-to-one to grant Fermi a provisional construction permit.

Enraged, Anderson called the permit the "result of Star Chamber proceedings," and complained that the AEC was confusing its promotional and regulatory functions—a charge that troubled the commission throughout its tenure and eventually brought about its reorganization. Representative Chet Holifield, a California Democrat and a member of the joint committee, attacked Strauss for "overruling the grave warnings" of his own advisory committee and proceeding "in a reckless and arrogant manner." Four days later, at the Fermi breeder's hastily arranged groundbreaking ceremonies on the short of Lake Erie, Strauss chided his congressional critics; he said that their opposition "aids the attack which is being directed against the free enterprise development of nuclear power in this country."

Anderson retaliated by urging several citizens' groups and the United Auto Workers to protest the plant's licensing in hearings the following year. And when the nuclear-plant insurance bill (the Price-Anderson Act) was passed, in 1957, he added a provision making the AEC advisory committee a statutory body whose findings must be public. Beyond that, he won a further amendment—which has grieved the nuclear industry ever since—requiring public participation in all nuclear-plant licensing. Finally, Anderson successfully led the Senate opposition when Eisenhower nominated Strauss to be his secretary of commerce, in 1959.

In addition to congressional obstacles, the Fermi breeder had to survive a long battle in the courts. When the AEC issued its final construction permit, in 1958, the United Auto Workers appealed, and in 1960 the AEC's ruling was reversed. Only after the Supreme Court reversed the decision, in 1961, was the permit allowed to stand.

Detroit Edison's troubles with the breeder were far from over. Construction and reconstruction were continual. Technical and design problems strung out for years: among other things, the core and the steam generators had to be redesigned.

Steam generators are troublesome pieces of equipment in all sodium-cooled breeders. The generators are vessels in which hot sodium from the core flows around pipes filled with water. When the water absorbs heat from the sodium, it becomes steam and drives a turbine. But sodium is a volatile metal that explodes on contact with water and burns in air. Even pinhole-sized leaks in the pipes can therefore have destructive and time-consuming consequences. In 1962, the first of several sodium explosions at the Fermi plant ripped out part of the reactor's coolant system. Indeed, sodium-water "reactions," as the plant staff called them, became so frequent that the principal steam-generator pipes were named after the sound they made: Ker-Pow #1, Ker-Pow #2, and Ker-Pow #3. Although few serious injuries occurred, the repairs were costly and took many months to complete.

After the Fermi breeder at last went "critical," in 1963—four years behind schedule—more safety and repair problems held up the plant's operating license for another two years. More engineering problems followed licensing, and the plant did not begin commercial operation until 1966.

Cisler and his colleagues did not celebrate for long. Six safety devices, called "conical flow guides," had been added to the underside of the core, to improve the rush of sodium to the fuel, but after only three months of operation at low power, two of these foot-long plates broke loose and blocked the coolant's flow. A small part of the core melted, alarms went off, and the reactor was scrammed. Operators didn't know for months what had caused the fuel to melt, how much damage had been done, or how to deal with the radioactive debris. The fact that they knew so little led to concern on the part of the operators and the AEC that more fuel might melt. Fortunately, none did, and no one was harmed. The accident could have been much worse. According to one state public-health study, several thousand people downwind might have died if the containment building had been breached.

The fuel-melting accident only compounded the seriousness of still other disappointments. The plant had not bred any new fuel, because it kept breaking down. But as it turned out, even if the reactor had bred plutonium, the government had less and less reason to buy any for weapons, chiefly because it had begun to produce more plutonium of its own, at military plants, and bombs were being designed to use less. In 1954, Cisler had hoped to earn $100 a gram for the separated plutonium from the breeder. Instead, by 1957, its value was only $30 a gram, and by the early 1960s, about $10 a gram.

In 1970, the Fermi plant was started again, and ran for a while intermittently. To help recoup the rising costs, the owners thought of turning their commercial venture into a research project, but the fuel itself was nearly depleted, its radioactive power run down like a dying battery. Cisler tried to raise money from U.S. and foreign utilities to install an experimental core, with little success. Reluctantly, he turned to the AEC, which had conducted basic breeder research on Detroit Edison's behalf, and invited Seaborg, who was the chairman of the AEC from 1961 to 1971, to visit the site.

"We painted up the place to make it look like a going operation, but the fuel was so weak we really had to watch our timing," Eldon Alexanderson, who was then the plant's assistant superintendent, recalls. The operators wanted to "put on a show" for Seaborg, he says, and did so with precision: "We'd get up to full power just when [Seaborg] came through the gate. And once he went out the gate, we'd turn it right off. That fuel was on its last legs. And, we weren't very trustful of our thermocouples [incore thermometers], either; they were us slightly wrong temperatures."

In 1972, after Seaborg's visit, the AEC decided that the Fermi plant was a lost cause. A memo on Cisler's appeal for federal funds concluded that the research data from Fermi would be "perhaps useful, though not a priority input." The plant was shut down that year, after having run at full power for only about a hundred days in all. Cisler saw by 1972 that other private utilities would not chip in to help him, because the AEC was pressuring them to raise $250 million for a newer dream machine: the Clinch River breeder.

Walter J. McCarthy, Jr., was for a time the general manager of the coalition of owners that oversaw Fermi. Today he is the chairman of Detroit Edison's board. "My view right now, for an electric-power company like ours, is that the principal focus of attention on nuclear power should not be the breeder; it should, in fact, be making the light-water reactors operate reliably, safely, and routinely," he says. The Fermi plant continues to give him some concern. The sodium coolant—70,000 gallons that are still slightly radioactive—is stored there in airtight drums, but must be carefully removed by next year. To avoid the cost of disposal, the Fermi sodium has been given to the Clinch River project. (If that plant is killed, Detroit Edison will have to find another taker or a hazardous-waste site that can accept the sodium.) Once the sodium is removed, McCarthy will be able to leave the problem of Fermi's radioactive vessel to his successors. The vessel can't be dismantled for another fifty years—the time needed for its radioactivity to decline enough for crews to remove it without costly and cumbersome shielding.

Throughout the 1960's while the Fermi plant suffered one blow after another, Washington's view of breeder's couldn't have been rosier. As chairman of the AEC, Seaborg often made visionary speeches that described the "plutonium economy" of the future. He talked of building nuclear-powered merchant ships, planes, and rockets. The detonation of small atomic bombs would open up new sea-level canals and loosen natural-gas deposits.

Seaborg saw future heavy industry built around a complex of large breeder reactors may times the size of today's plants. Their plentiful and cheap power, for both heat and electricity, would recycle garbage and produce new metal alloys, ceramics, and plastics. Because power costs would be low, it would pay to extract raw materials from trash, creating a "junkless society." What's more, he said, "as used in breeder reactors," plutonium "will be the fuel of the future," a metal whose value "may someday make it a logical contender to replace gold as the standard of our monetary system." He mentioned this possibility in a speech on "large-scale alchemy," which he gave at a celebration of Hanford's twenty-fifth anniversary, in 1968.

"By the end of the 1960s, the AEC realized it had pretty well completed its mission: uranium-enrichment plants and plutonium-production lines [for weapons] were going, and [the AEC spun off the light-water reactor technology and got it on its way," Victor Gilinsky says. A nuclear-policy analyst since 1971, and an NRC commissioner since 1975, Gilinsky understands the AEC as well as anyone. "The AEC was a collection of odd projects, and [the commissioners] were looking for something to motivate people," he says. "But I think also there must have been a concern that unless you get involved in a large, multi-year project, your budget is vulnerable."

That large, multi-year project was the breeder. by pitching the machine to President John F. Kennedy's desire for innovation and world prestige (a desire that placed the breeder in competition with the space race for funds), Seaborg used it to revitalize his agency. In his 1962 report, "Civilian Nuclear Power," a response to Kennedy's request for a "new and hard look at the role of nuclear power in our economy," Seaborg argued that an ambitious breeder program would provide for "the maintenance of U.S. technological leadership in the world. . . ." His report described breeders as "essential to long-range major use of nuclear energy."

The Joint Committee on Atomic Energy willingly shared Seaborg's view. Representative Holified, who, during the Fermi debates, had challenged the AEC's "reckless and arrogant manner," did warn Seaborg in 1962 that "major problems remain to be solved" with breeders, but within a year Holifield was advocating that billions more be spent for breeder development, "to bring in a perpetual source of energy."

Not everyone was convinced, however. Louis Roddis, Jr., then the president of the Atomic Industrial Forum, questioned Seaborg's "urgency and optimism" about breeders. Lilienthal mocked the breeder: "When you get asked hard questions about the old-fashioned atomic-power plant, just say 'breeder' and you're off the hook, because a breeder atomic plant has never yet been built, so who can dispute the lovely forecasts?"

Nevertheless, the breeder, helped by practical politics, was on its way. In 1964, as a concession to the coal lobby, which feared the nuclear-power industry's competition, the joint committee decided to cut research-and-development money for light-water reactors (a close threat to coal power) and to increase the budget for the breeder (a more distant threat). Within the AEC, the breeder became supreme. "The whole AEC became a vehicle for this project, and everything had to fit with it," Gilinsky says.

The AEC hired Milton Shaw, who had been an administrator in the Navy's submarine program under Hyman Rickover, to direct reactor development. Shaw served from 1964 to 1973, and his stewardship both advanced and retarded breeder development. Shaw focused on the liquid-metal fast breeder reactor (LMFBR), cooled by sodium with a U-238-to-Pu-239 fuel cycle, because he believed that this scheme was the closest to perfection. Thus, during his tenure, breeders cooled by helium gas (which has even less of a moderating effect than sodium), steam (an alternative that one of the nuclear contractors pressed for), and salt were essentially abandoned, and thorium-to-U-233 as an alternative fuel cycle was slighted. At the same time, having limited his options, Shaw deferred building a demonstration breeder and concentrated instead on an ambitious component-testing program, which delayed for years the building of an actual plant—a strategy he had learned from Rickover. Above all, Shaw was cautious. "My wife jokes that when I build a dog house, it'll withstand a seismic event," he said recently.

While Shaw was narrowing the scope and slowing the pace, the AEC commissioners pushed on with their vision of breeders as the saviors of an economy that would soon be starved for energy. In a supplement, issued in 1967, to Seaborg's 1962 report, the AEC said that "immediate emphasis" should be put on the fast-flux test facility (FFTF) at Hanford, a reactor designed to test breeder fuel, but the AEC promised that "a number of sodium-cooled fast-breeder demonstration plants [would] be built during the 1970s." In 1967, the AEC gave Shaw's LMFBR its highest priority, predicting that the doubling time for producing new fuel could be as short as eight to ten years—then also the doubling time of U.S. electricity demand.

But politicians and industry executives wanted more than rhetoric: they wanted contracts. Representative Craig Hosmer, a Republican of California, was aware of European breeder programs that had commenced, and he proposed in 1967 that the United States build three prototype plants: one cooled by liquid metal, one by gas, and one by steam. Also in 1967, the leading reactor contractors, General Electric and Westinghouse, urged the joint committee to authorize a breeder demonstration plant within two years. General Electric favored the steam-cooled breeder, because it has mastered a similar technology for light-water reactors, rather than the sodium-cooled model favored by Shaw. Both firms saw breeders as useful tools for selling their light-water plants to utility companies, since breeders would guarantee future fuel supplies.

President Lyndon B. Johnson mentioned the breeder's importance in his 1967-budget message, but at the end of the year, at a ceremony marking the twenty-fifth anniversary of the first chain reaction, he cautioned that plutonium could be diverted from breeders for weapons. In 1968, the Edison Electric Institute, a trade group for the privately owned utilities, released its own breeder study, drafted by a panel that Walker Cisler chaired. The institute panel concluded that "the electric utility industry needs fast breeder reactors to protect its rapidly growing investment in nuclear power by conserving low-cost ores," and recommended building at least two LMFBR demonstration plants in the early 1970s and continuing work on gas- and steam-cooled designs.

Thus, by the late 1960s, pressure was increasing to build more experimental and commercial breeders—pressure arising in part from glorious economic predictions and the knowledge that other countries were moving ahead with their own breeder technologies.

Seaborg worked to make President Richard M. Nixon an advocate of the breeder in 1969, using as his agent the chairman of the President's Council of Economic Advisers, Paul McCracken. In a letter to McCracken about energy options, in 1970, Seaborg called the breeder "an urgent national need." By his logic, the program was inevitable. Seaborg wrote: "Clearly, all the considerations—technical, economic, and political—have converged in a most timely and mutually reinforcing manner so as to impel us to move forward aggressively with development of the breeder system." Apparently, during this decade of dreams, the question asked about the breeder wasn't 'Why?" It was "Where?" and "When?"

When President Nixon announced the first national energy policy, in 1971, he touted breeders as "our best hope today for meeting the nation's growing demand for economical, clean energy." But in the same year, the need for breeders began to ebb. As new deposits of natural uranium were discovered, fears of a nuclear-fuel shortage by the late 1980s were eased. (The shortage isn't expected now until 2050 or beyond, if it occurs at all.) The number of new nuclear plants was smaller than the AEC had expected, as a result of rising construction costs and delays. Furthermore, electricity prices, which had fallen steadily since 1950, leveled off in 1971 and then began an ascent that has continued to the present—the result of rising costs for oil, coal, and new plants. In reaction, the growth rate of electricity consumption fell drastically, and with it the need for many nuclear-power plants and breeders to fuel them.

At this turning point in 1971, the AEC revised its forecasts of installed nuclear capacity radically. For the year 1975, the forecast was dropped from 59 to 54 gigawatts; the actual capacity in 1975 proved to be 37. (One gigawatt, or one billion watts, is about the capacity of one large light-water plant.) For the year 1980, the forecast was dropped from 150 to 132 gigawatts; the actual capacity proved to be 53. And for the year 1985, the forecast was dropped from 300 to 280 gigawatts; the capacity expected now is about 90. Longer-range federal forecasts of American nuclear capacity have fallen even more steeply as the nation's demand for electricity has declined and nuclear plants have been delayed: for the year 1990, from 508 gigawatts predicted in 1972 to 121 predicted now, and for the year 2000, from 1,200 gigawatts predicted in 1972 to 165 now. Thus, well before the federal government and a group of utilities signed their agreement to fund a 375-megawatt breeder on the Clinch River—the reactor itself to be made by Westinghouse and the plant to be operated by the government-owned Tennessee Valley Authority—official predictions had begun to undermine the justification for it.

At about the same time, estimates of the plant's cost began to increase. "The AEC had an estimated cost for the Clinch River reactor of about $500 million—an estimate that was at the time known to be stripped down," Chauncey Starr, vice chairman of the Electric Power Research Institute, said recently. "It was a sales number more than a realistic number, and a lot of people in the industry knew it at the time."

Still the utility industry went along, agreeing to pay half of Clinch River's cost. A few executives believed that the breeder actually would be needed soon, but most thought that they simply had no choice. "The industry had no interest in getting in, in a financial sense," Starr says. "The driving force was the AEC. The AEC was asked by Congress, 'Why do you want to go ahead with this program?' and they said, 'Well, industry wants it. Industry is the customer.' And then Congress said to the AEC, 'We don't believe it unless industry has some of their money in it.' The AEC wanted industry to put money in, and brought pressure on the industry, on the basis that at that time industry was getting into the light-water reactor business [and] needed AEC support. Given a choice, I don't think industry would have put up the money."

The utility companies that had already committed themselves to nuclear power were especially vulnerable to the AEC's pressure, because they believed they needed to guarantee future fuel supplies for their reactors, and they did not want to invite the displeasure of the commission's regulators. Thus, the nuclear-equipped utilities jointed the AEC in trying to persuade the rest of the industry that atomic ,energy held the key.to the future. To do this, they cited the predictions made by the AEC that nuclear power would become more economic than other energy sources; the conviction of the reactor manufacturers that "economies of scale" would allow bigger nuclear plants to generate electricity more cheaply than smaller ones; and, finally, their own belief that neither of these promises could be realized until commercial breeders yielding an inexhaustible supply of cheap fuel had been developed.

From the beginning, many utilities had doubts about what their commitment to the breeder would entail. "Like Alice, they feel they will be falling down a hole without knowing where it leads," Peter McTague, who is now the chief executive officer of Green Mountain Power Corporation, in Vermont, said at an Atomic Industrial Forum seminar on the breeder in 1971. (At the time, he was a consultant on utility-plant engineering.) "Many of them are afraid that, instead of a rabbit hole leading to wondrous adventures, it may be a rat hole leading to financial disaster," he said. At the utility industry's urging, therefore, the joint committee persuaded Congress in 1972 to require the federal government to pay for all cost overruns incurred in building the Clinch River plant. The $250 million agreed to in 1972 would be all that the utilities would ever have to put up. (This sum now represents a small fraction of Clinch River's projected total expense.) Nevertheless, several companies refused to sign.

Today, although more than 700 utilities have been enlisted to help pay for the plant, even some of the most enthusiastic contributors have regrets. "If there was any legal way that I could not pay that money, I would seek it out," says McCarthy, of Detroit Edison. (His utility has already paid half of the $6.9 million it pledged when Walker Cisler was chairman of the board.)

Once the utilities had committed money to Clinch River, they expected to have a say in its development. But the utility—government entity that was created to supervise the project proved to be leaderless. Decisions fell to everyone, and to no one. Delays and compromises abounded. Costs escalated. And as the federal government found itself paying a larger share of the bill, it naturally expected—and gained—a larger share of the responsibility. A reorganization of the project in 1975 gave the Energy Research and Development Administration (ERDA) a dominant role, but still required that the utilities participate in much of the decision-making. Today, the Clinch River project is run for the most part by the Department of Energy, which is also providing more than 90 percent of the money. (The AEC was abolished in 1975. Its regulatory functions were assigned to the new Nuclear Regulatory Commission and its research and promotional functions to ERDA, also newly created. In 1977, ERDA was turned into the cabinet-level Department of Energy.)

Control aside, many participants today feel that the project was a mistake for another reason: Clinch River has to undergo complete licensing by the NRC. The AEC used licensing to convince the joint committee that the plant would demonstrate for the utility companies all the steps they would have to take whenever they began to build breeders on their own. The argument had some appeal at the time. Since then, however, nuclear-plant licensing has changed fundamentally. In 1969, when the plant was being planned, Congress passed the National Environmental Policy Act (NEPA), which required that environmental-impact statements be drafted for major construction projects. In 1971, a federal court ruled that the AEC must abide by the rules of NEPA in its regulation of nuclear plants. The same year, the Scientists' Institute for Public Information successfully sued to have the impact statement cover the potential impact of the entire "plutonium economy" that would follow from the breeder's deployment, as well as the impact on the Clinch River site itself. The AEC issued this broad impact statement in 1974, and its optimism has provided grounds for attack by opponents ever since.

There are still other reasons for the utilities to regret their involvement. The problem of reprocessing is one. When the Clinch River contract was coming together, in 1971, there appeared to be a commercial reprocessing industry for spent nuclear fuel in the U.S. Today there is none. Reprocessing plants are essential to the breeder, because they would chemically separate plutonium and uranium from used fuel in both light-water and breeder reactors: plutonium made in light-water plants would go to a breeder as start-up fuel; later, when plutonium was "bred," it would be shipped to light-water plants and other breeders as new fuel.

The reprocessing plant at West Valley, New York, worked intermittently from 1966 until 1972, when it was shut down. Its owners abandoned the operation, as a result of safety and environmental, problems. General Electric decided in 1974 that a new reprocessing plant it had just finished at Morris, Illinois, was unworkable, and beyond fixing. A third commercial plant, at Barnwell, South Carolina, was under construction when the breeder contract was signed. Presidents Gerald R. Ford and Jimmy Carter deferred commercial reprocessing indefinitely, because of the weapons-proliferation threat it posed, and construction has been halted. Even though the Reagan Administration favors reprocessing, the plant probably will not be finished, for lack of funds. Barnwell's owner, Allied-General Nuclear Services, may try to sell it to the government-owned Savannah River nuclear complex, adjacent, for the recovery of plutonium for weapons. The Exxon Nuclear Corporation once talked about building a reprocessing plant near Oak Ridge, with the breeder as its chief client, but this plan has also been dropped.

In addition to all of these discouragements, much of the popular enthusiasm for nuclear power that once existed had begun to evaporate by the 1970s. After the 1973 Arab oil embargo, nuclear-power advocates thought that they would become heroes, because they could provide a reliable alternative energy source. But the demand for oil arises chiefly from uses other than electrical power, and so nuclear plants are not really a factor—the industry's claims to the contrary nothwithstanding. Also, the recession caused by rising energy costs provoked a cut in the demand for electricity and wiped out the need for more generating capacity. All nuclear plants ordered since 1974 have been canceled, and none has been ordered since 1978, the year before the notorious accident at Three Mile Island. Thus, to many who believe that nuclear power should have a bright future, the Clinch River plant has become a last hope. Alvin Weinberg calls the Clinch River breeder the "holy grail of nuclear power's developers." It poses a dilemma for them, as well. As one publicist for the utility industry reasons, if the utilities don't support Clinch River, they could jeopardize the prospects of any other breeder they might favor. On the other hand, if they do support it and the reactor is canceled—or is built and doesn't work—they could lose their credibility with the public and Congress.

Until 1974, the Clinch River breeder had an easy time on Capitol Hill. That year, the protective body that had once nurtured breeders—the Joint Committee on Atomic Energy—was abolished in a broad congressional reform, and jurisdiction for nuclear affairs was scattered among more than a dozen committees and subcommittees in the House and Senate. Each one has become a potential battleground.

When cost estimates jumped to $700 million, in 1972, the increase was explained as the normal cost growth, or cost overrun, associated with federal research-and-development projects (proponents speak of "growth" and opponents of "overruns"). But when estimates of final cost reached $1.7 billion in 1974 and exceeded $2 billion in 1977, boosters of the Clinch River project were hard pressed.

Much was at stake. By then, the AEC had canceled plans for other demonstration breeders, and turned most of its attention to Clinch River. The commission had been forced to economize, in part because of expensive problems incurred by the FFTF, the small fast-neutron reactor at Hanford.

The FFTF was supposed to cost $87.5 million and be finished in 1974; its cost was $647 million when it began operation last year. To many, the FFTF is a machine without a mission, because, except for its smaller size, it is similar in design to the Clinch River reactor. The FFTF can never be a substitute for Clinch River, however, because it is not supposed to breed fuel or to make electricity. Instead, it was designed mainly to show how different breeder fuels perform. The results were supposed to help the planners of Clinch River, but the delays in building the FFTF have voided this function: the Clinch River plans were 87 percent complete when the FFTF began to run.

One reason the Clinch River breeder is such a contentious project is that, unlike the FFTF, it has become a hodgepodge of missions for a mixed group of backers. As other breeder projects have been canceled or deferred, the Clinch River reactor has been saddled with three different functions at once: it is to be a model of a larger breeder; an experimental plant to test new components; and a demonstration plant licensed and run in a utility system, to show the economic potential of breeders. Ordinarily, such functions are separate in research and development. According to Freeman Dyson, a nuclear physicist at the Institute for Advanced Study at Princeton, "If you do a research-and-development program, most of the things ought to fail. That's the stupidity of doing things on a big scale. When you reach the scale at which you can't afford to have a failure, then you're too big." Dyson says, "There should have been about twenty-five small-scale experiments, which could have easily been done for the cost of one Clinch River."

In 1977, as costs rose, ERDA convened a panel of breeder experts. The panel was dominated by nuclear-industry representatives, and voted—predictably—eight to four to continue the project. The minority advocated dropping the Clinch River breeder because the projected demand for electricity had fallen and the fuel-efficiency of light-water reactors had potential for improvement. (Later studies by the General Accounting Office have asserted that the Clinch River project lacks direction and purpose, involves dubious accounting and contracting procedures, and—if built—should be the last breeder until the technology's future is thoroughly reassessed.)

President Carter took office with a strong personal dislike for plutonium, breeders, and nuclear proliferation, and he, too, tried to stop Clinch River. His opposition actually seemed to help the project for a while: Carter gave the breeder's supporters a common foe to rally against, and he gave Congress an institutional reason to reject his pleas. According to Starr, EPRI's vice chairman, "Congress resented that the White House wasn't working with it on many programs," and so it used the breeder "as a symbol of its political independence from the White House." Congress voted money to continue the work on the project throughout Carter's term in office, although by narrowing margins.

One of the congressmen who criticized the breeder in the late 1970s was David Stockman, who was then a Republican representative of Michigan. He didn't gain much attention for his views then, but they have been invoked often since. In 1977, Stockman said to Congress that "no further subsidization" of the Clinch River program was justified, because it was "totally incompatible with our free-market approach to energy policy." But when Stockman became President Ronald Reagan's budget director, he changed his position on the breeder, in order to ensure the support of Senate Majority Leader Howard Baker, of Tennessee, for the 1982 budget. In an interview published in this magazine in 1981, Stockman said, "I didn't have to get rolled. I just got out of the way. It just wasn't worth fighting. This package will go nowhere without Baker, and Clinch River is just life or death to Baker. A very poor reason, I know."

Baker's stake in Clinch River runs deep. First, as a former member of the Joint Committee on Atomic Energy, he has been for years an avid supporter of nuclear power. He is personally convinced that it represents the best hope for this country's energy future. Second, he shares his state's pride in the nuclear achievements that have been made at Oak Ridge since the war, by the national laboratory and more than a dozen research-reactor projects there. Finally, the breeder means money and jobs for local manufacturers, construction workers, contractors, and supporting businesses.

At present, among the states in which research and manufacture related to Clinch River are being done, Tennessee ranks third—after California and Pennsylvania—in economic benefits from the project, with 502 jobs and $164.8 million. Its share will increase dramatically if the plant is built. At the height of construction, the project is expected to create between 4,000 and 8,000 jobs, the largest percentage of them in Tennessee. And of Clinch River's total expenditures, Tennessee should collect more revenue than any other state. The reactor's total cost is open to debate. The Department of Energy has estimated a cost of $3.6 billion, but congressional critics think that the General Accounting Office's figure of $8.5 billion is closer to the mark. According to the GAO, the $3.6 billion estimate among other things understates the cost of plutonium and of running the plant, overstates the potential revenue from selling power, and omits interest on the money borrowed for the project, which alone may come to $3.9 billion. Of course, the more Clinch River ultimately costs, the more Tennessee is likely to prosper—a fact that must give Baker little pleasure when he faces the reactor's critics.

Other fiscal conservatives have taken up the fight that the Reagan Administration has avoided. Indeed, one sign of Clinch River's vulnerability these days is that debates have begun about how much money would have to be spent to end it. A lobbyist for the nuclear industry estimates that scrapping the project could cost $2 billion or more, including damage suits from the utilities that donated money outright, expenses to landscape the site, and contracts for equipment that will never be used. (About half of the components have already been built.) The House Science and Technology Committee, which last voted, in 1981, to delete funds for the Clinch River breeder, has estimated a cost of $44.5 million. The General Accounting Office has made several estimates as well, none of them greater than $1 billion.

The Clinch River breeder is one of the last great federal enterprises (outside the Pentagon) remaining to be scaled down or ended in the effort to reduce the deficit. It seems that in the government, only Reagan and Baker stand between the project and its swift abandonment. The Taxpayers Coalition Against Clinch River Breeder Reactor, founded last year, includes such economically conservative groups as the National Taxpayers Union and the Council for a Competitive Economy, along with traditionally liberal environmental groups such as the Sierra Club, Friends of the Earth, and the National Audubon Society.

Deferring to the new emphasis on economic retrenchment, the Taxpayers Coalition likes to quote the economist Kenneth J. Arrow, who has written that the Clinch River breeder "is not an economically sound investment at this time," and the economist Walter W. Heller, who has written that spending more on the plant "would be throwing good money after bad."

Clinch River's critics raise the question of the plant's technical wisdom, as well. S. David Freeman, former chairman of the Tennessee Valley Authority and now a member of the authority's governing board, has called the plant a "technological turkey," by which he means that it is obsolete, as a result of delays and foreign developments.

Among nuclear scientists who do not wholeheartedly favor Clinch River, some fear that to criticize it might be interpreted as an attack on the promise of nuclear power in general. Nuclear power has worked as a source of electricity at a lower cost than comparably sized coal-fired plants in some parts of the United States, and more economically than oil in most states; nor does it routinely pollute the atmosphere, as coal does. But, according to current projections, all the plants operating, under construction, or on order will have ample supplies of domestic fuel well into the next century, and so, these scientists say, the need for Clinch River is not urgent, at least in terms of energy demand in the near future.

To avoid giving the appearance of having lost faith in Clinch River, the Electric Power Research Institute's office near Chicago is underplaying its work on a follow-on breeder. Starr will say, however, that he thinks the Clinch River breeder project "was just bad management on a national scale." Given his choice, he would prefer an ambitious research program for gas-cooled breeders, and, like Alvin Weinberg, who prefers molten-salt breeders, Starr supports the Clinch River project mainly because it is ready to be built now. Eugene Wigner thinks the Clinch River plant should be built for the "experience," but prefers that more work be done on the thorium-to-uranium breeders that he has advocated since the war, because they would concentrate about one tenth as much fissionable material in one place. Hans Bethe thinks that a different design of breeder should be pursued. Henry DeWolf Smyth, formerly the chairman of the Princeton physics department, who wrote the official chronicle of the Manhattan Project, thinks that "anything that's been sitting around, fought over, and redesigned and redesigned" invites safety complications with each change. Smyth says, "I think you better just pick a new site and start over, but I guess that's too radical for Congress." Even Glenn Seaborg is beginning to have second thoughts. "There's a feeling so much time has passed that the Clinch River breeder is obsolete, and that a newer, more modern approach should be launched," he says. "I think it may be coming to that point."

A number of outspoken advocates of the Clinch River breeder can be found in the scientific and technical communities. For example, Manson Benedict, a veteran of the Manhattan Project who is now an emeritus professor of nuclear engineering at the Massachusetts Institute of Technology, believes that the LMFBR "is the best prospect the United States has for nuclear-power generation after our limited resources of low-cost natural uranium are used up." He says that the proposed reactor "is the next logical step in the series of progressively larger breeder reactors that have been built in the United States." From a practical point of view, he says, the completed parts, the money spent so far, and the work of "a generation of engineers trained to design and build this plant and put it into operation" would all be "irretrievably lost if the Clinch River plant is not built."

Benedict and others also point to the nation's stockpile of 250,000 to 300,000 metric tons of U-238. The U-238 has accumulated over the years as a by-product of U-235's extraction from uranium ore, to make bombs and to fuel light-water power reactors and submarines. If all of the Stockpiled U-238 were placed in breeders and converted, it would yield more than 200,000 metric tons of Pu-239. The plutonium could be used by breeders and conventional reactors as fuel to generate about 700 times the electricity made in the United States last year, according to an analyst at Oak Ridge.

The scientists who favor Clinch River are joined in their advocacy by the Committee on Jobs, Environment and Technology, a private organization founded last fall to mobilize support for Clinch River in the midst of fierce congressional opposition. With a full-page ad in a number of newspapers, the committee went on the attack. The ad said, "We don't usually agree . . . but on Clinch River we do," and listed eighteen labor unions, the National Association for the Advancement of Colored People, the Chamber of Commerce of the United States, the General Federation of Women's Clubs, the National Conference of Black Mayors, and the National Association of Manufacturers as new and unlikely allies. Less conspicuous in the ad were the names of the breeder's traditional supporters—among them the American Nuclear Energy Council (the industry's lobby), the American Nuclear Society, the Atomic Industrial Forum, Inc., and the Edison Electric Institute. The ad called the Clinch River breeder "the result of a 20-year alliance between the federal government and private industry," and said that the project "represents the spirit of innovative research and development that has characterized U.S. history at its best."

It is quite possible that the history of Clinch River will not go beyond reams of paper and tons of cleared earth. Last December, the House, aroused by the prospect of further cuts in federal social programs, voted to eliminate appropriations for the plant from the fiscal 1983 budget—the first time Clinch River had lost in a full-House vote. The Senate, just before its adjournment, agreed by a margin of only one vote to continue the appropriations.

A House-Senate conference committee, which met to come up with a budget resolution that would continue federal spending in lieu of agreement on a formal federal budget, compromised: $14 million was cut from the Senate's appropriation, leaving a balance of $81 million. As part of the deal, the Department of Energy must try to find ways to cut costs and raise more money, either from the utilities or, failing that, perhaps by issuing federally guaranteed bonds; its report is due this spring. In his proposed budget for the 1984 fiscal year, Reagan has asked Congress for $270 million.

Attention now turns to the committees of the new Congress which must authorize further spending in the 1984 budget before any specific amounts can be appropriated. As of this writing, a subcommittee of the House Science and Technology Committee is likely to take the first vote. Its chairman, Representative Marilyn Bouquard, a Democrat whose district includes Oak Ridge, favors Clinch River and expects a tough fight. In the Senate, the threat to Clinch River is more subtle, for it comes also from the nuclear community itself, and involves maneuvering by the federal laboratories to protect their respective roles in the development of breeders. No votes are likely in the Senate until after the full House acts; then the Energy and Natural Resources Committee must decide whether to report a bill authorizing funds to the Senate. The committee's chairman, James McClure, a Republican from Idaho, believes that regardless of what happens to the Clinch River project, a pool-type reactor, known around the Senate as "the Snake River breeder," should be built in his home state. McClure is in an uncomfortable position, however. As a member of the Republican leadership, he is obliged to support Baker's interests. Publicly and with his votes, he has, but he is said to be watching for an opportunity to help Idaho without hurting Tennessee.

One body that Baker can't influence is the Advisory Committee on Reactor Safeguards (ACRS), which has remained intact through all the reorganizations of the AEC. The committee's verdict on the dangers of the Fermi site provoked a political firestorm in 1966, and a negative ruling on the Clinch River plant would do the same. Significantly, the committee is having some real trouble making its decision, which might come later this year.

First, the ACRS is concerned about the breeder's worst safety problem: the "hypothetical core-disruptive accident." The last time the committee considered this risk, in 1976, it pointed out that most of the safety analyses of breeders are based on computer codes rather than actual tests, and that these codes "are at best semi-quantitative once fuel melting begins." The predictions by safety analysts about what might actually happen after breeder fuel melts proceed "primarily by plausibility arguments," the committee reported. It concluded that because sodium boiling could speed up the chain reaction in a core that contains "several critical masses" of plutonium, it was impossible "to establish with certainty that a severe excursion could not take place."

Second, the ACRS can't say definitely that the proposed breeder would be safe at the Clinch River site. All it had concluded by last July was that a conventional light-water reactor, of the type in operation around the country, probably would be. "The applicant is going at his own risk" by preparing the site for construction, a committee member said during recent hearings. "There is going to be a hole in the ground, all right, but there is not going to be a [Clinch River breeder] sitting there before we have come through with some further words on the matter."

The committee's words will be academic without Congress's approval of money to build the breeder. Difficult questions regarding the breeder's safety and its financial and technical warrants seem only to confound the congressmen who are undecided, and to reach them, boosters of the breeder are emphasizing emotions. Octave DuTemple, the executive director of the American Nuclear Society says, "You can make all the technical arguments you want, but when you're in a political system you've got to really grab them, see? And I think one of the best arguments to grab them is simply patriotism and waving the flag and American supremacy in technology and the need for energy in the future."

That, after all, was what President Nixon seemed to have in mind when, in 1971, he declared the goal of completing the fourth breeder by 1980. His support was not purely patriotic, however. After announcing the project's high priority in the White House press room, he walked back to the Oval Office with Seaborg, and on the way, he made his interest in the breeder perfectly clear: "I want it built in California," he said. A few months later, Nixon announced at Hanford that he would authorize a second breeder demonstration plant. But by October 10, 1973, with his attention consumed chiefly by the growing Watergate scandal, Nixon proposed "leapfrogging" the breeder in favor of fusion, a remark overshadowed that day by Vice President Agnew's resignation.

According to Edward Teller, the breeder "was started by famous people who made the atomic bomb. And once you get [an idea like this] started, you cannot stop it. There are vested interests. Not only the vested interests of industry but the vested interests of administrators and politicians who fought for it. And the vested interests of scientists who put their whole lives into it. And they get indignant if you propose an alternative, yet alternatives are there, and we should discuss them."

Fusion—an altogether different nuclear technology—is one of several alternatives to the Clinch River design. Others include a fundamentally different arrangement for a liquid-metal fast breeder, a different fuel cycle, and exploitation of natural, renewable energy sources.

The different arrangement of the liquid-metal fast breeder is the pool design, which Walter Zinn invented for EBR-2 and which the French and the Soviets later adopted. The pool replaces the loops of pipe that were conceived to make reactors suitable for submarines and that became the basis for the design of the EBR-1, Fermi, and Clinch River plants. A study done in 1976 at EPRI by the architecture and engineering firm Burns and Roe, Inc., the designer of Clinch River, concluded that the pool configuration would be easier to build, cheaper to build and run, and safer, in most respects, than the loop, because it is simpler. By 1976, however, Clinch River's loops had been approved. Experts disagree about whether the pool or the loop is inherently safer. Teller, who has criticized all breeders as unsafe for years, dismissed the controversy, at a conference on energy technology in 1981, this way: "Pool, loop—loop, pool. It's the same word spelled backwards."

The search for a breeder fuel cycle that would make weapons proliferation more difficult has persisted since the 1940s. The thorium cycle favored by Wigner and Weinberg attracted new attention during the Carter Administration, because the fuel it breeds (U-233) can be made more resistant than Pu-239 to application in a nuclear weapon. (U-233 can be treated to become extremely difficult to separate and purify to achieve bomb-grade quality.) Moreover, the thorium cycle avoids most of the toxic and explosive risks associated with the handling of plutonium. The molten-salt-cooled breeder represents one approach to the thorium cycle, but its highly corrosive fuel is a disadvantage. Another approach, the light-water breeder, was supported by Carter when he tried to abolish Clinch River. Admiral Rickover had converted a government-owned nuclear-power plant, which previously had been run by a private utility, at Shippingport, Pennsylvania, into a light-water breeder, in order to study such a reactor's potential. Carter threw the switch that started up the plant, in 1977. It was shut down last year, and until the core is examined, scientists will not know whether or not the plant bred new fuel. Some analysts believe that the decreased coolant required for a light-water reactor to breed at all is a safety hazard.

A gas-cooled, fast neutron reactor is thought to be an adaptable breeder of uranium or plutonium; its coolant, helium, has even less moderating effect than sodium on the neutrons passing through it. According to some analysts, however, a loss-of-coolant accident would pose a serious problem, because once the helium was gone, there would be no medium to absorb the core's intense heat, and fuel melting would occur immediately. Thus, although gas-cooled, slow-neutron reactors moderated by graphite have been built in Pennsylvania and Colorado, no one has ventured to build an unmoderated gas-cooled breeder.

The two alternative nuclear technologies being studied are based on fusion—the power of the sun—in which energy is released when very light atoms are squeezed together, rather than when very heavy atoms are split apart, as in fission. A fusion reactor would accomplish this by trapping the atoms in a chamber, surrounding the chamber with magnets, and directing the magnetic fields inside to contain the atoms so that they could be made hot enough to fuse. The technology is at an early stage of development, largely because of its extreme physical demands. In order for a fusion reactor to work, the chamber's temperature must be one hundred million degrees Centrigrade (several times hotter than the center of the sun) while the temperature of the magnets, inches away, must approach absolute zero (the coldest that physical materials can become).

Advocates of fusion want work on the breeder halted and the funds diverted to their cause. They say that if the breeder is needed after the turn of the century, and if fusion doesn't appear more promising by then, there would still be plenty of time to revive an aggressive breeder program. Advocates of breeders, however, warn that such a strategy could be dangerous. Donald Trauger, the associate director of the Oak Ridge National Laboratory, says, "The last thing you want is a crash program for breeders. These plants have to be scaled up gradually, to avoid safety and technical problems."

In the scientific community, fusion must compete with a hybrid scheme that involves both breeder and fusion technologies. A fission-fusion reactor would heat light atoms, without having to sustain the reaction, to release stray neutrons; the neutrons would then be absorbed in a blanket that would be transmuted into plutonium in one scheme, or uranium in another. Of course, the plutonium version would keep alive the threat of weapons proliferation. That threat would be diminished if the uranium version were pursued. The supporters of fission-fusion technology, Bethe and Teller among them, assert that either version would be environmentally cleaner and safer to run than other breeders. According to Bethe, "Seaborg has said the breeder is an alchemist's dream. It is, of course. But maybe the fission-fusion hybrid is an even better dream." Like the breeder in the 1940s and 1950s, however, fusion technology is an entrancing prospect based on lovely forecasts rather practical experience.

The ultimate nuclear-energy source is the sun, whose radiation is being studied as a source of both heat and electricity. So far, solar power is nowhere near providing electricity on a large scale, but other domestic and commercial uses—space heating, water heating, and low outputs of electricity—are already practical. Bernard Feld, who was Leo Szilard's research assistant on the Manhattan Project and is now a nuclear physicist at the Massachusetts Institute of Technology and the editor in chief of The Bulletin of the Atomic Scientist, has done theoretical work on solar energy. He says, "If, like me, you really feel that fission power is an interim solution to a difficult problem, and that the long-term solution we should be looking for is something involving solar energy, then the breeder looks rather superfluous."

If prospect for the breeder seem bleak in the United States, they are only a little brighter overseas—despite the exhortations by the nuclear industry here that Americans are losing the race for an exportable commercial plant.

Publicists at the Atomic Industrial Forum enjoy leading press tours to France and Russia to show American journalists how they think nuclear programs ought to be run. In doing so, they unwittingly confirm the judgment made in the late 1940s by James Newman, who helped to draft the Atomic Energy Act of 1946, that if nuclear power is to succeed, it must be as an "island of socialism," distant from commercial notions of profit and loss. The tours also confirm that even with the full resources of the state behind them, developers of nuclear power—and especially of the breeder—can't avoid conflict.

France, the undisputed front-runner in the race for a commercial breeder, took first place by copying the Americans. Rapsodie, a 40-megawatt loop-type breeder, began operating in 1967. Phénix, a 250-megawatt pool-type breeder, began operating in 1973. Superphénix, a 1,200-megawatt pool-type breeder, is expected to run in 1984. "Translated in American terms, Rapsodie is our EBR-2, Phénix is our Clinch River, and Superphénix is our 'large developmental plant [LDP],' to be followed by the commercial plants," Bertrand Barré, the nuclear attaché in the French Embassy in Washington, says. He is quick to point out the differences, however: Rapsodie had no steam generator and therefore never produced electricity. Furthermore, a sodium leak restricted its power from 1978 until the reactor was shut down last year, to avoid costly repairs. Phénix suffered a string of sodium leaks, but eventually did breed about 15 percent more fuel than it consumed, according to the latest estimates. When the Superphénix begins operation, it will produce about as much electricity as an American light-water plant does, but at a much higher cost. Barré's reference to the LDP is to a sequel to Clinch River that was discussed in the United States during the 1960s and 1970s and then deferred; now the closest American cousin of Superphénix is the breeder that EPRI is planning near Chicago.

Having one state utility and one state nuclear agency has made it easier for the French to develop their own breeders, but the process has not been as trouble-free as the Atomic Industrial Forum's press officers imply. The public is not allowed a significant voice in the licensing procedure, and as a result its actions have been violent: a demonstration against Superphénix in 1977 left one person dead and dozens injured; someone shot a bazooka at the plant last year, causing $17 million in damages.

One reason the French are so admired by breeder advocates in the United States is that they have "closed the fuel cycle"—recovered plutonium and recycled it as fuel. This feature has especially impressed Weinberg, because it is another step toward the "energy autarky" that he hopes breeders will create. Weinberg's enthusiasm is undercut, however, by the fact that the French, having shown what they could do with plutonium as fuel, decided last year that the Superphenix would be more useful making plutonium for bombs. (The government wants to develop a nuclear tactical force, and to replace a military-production reactor that is about to be shut down.) The state utility's weekly review said last spring, "A reinforcement is needed, and it is ensured (after Phénix) by Superphénix, which will produce . . enough plutonium . . . to make about 60 atomic bombs each year."

In the Soviet Union, where questions from visiting journalists about plutonium use are never answered, the breeder program has stalled after an ambitious start. In 1973 and 1974, the BN-350 loop-type breeder, which is about the size of the proposed Clinch River plant, suffered sodium fires and explosions so serious that an American satellite is said to have detected them. The BN-350 was built on the Caspian Sea and was designed to be a desalinization plant, too, but this function has also proved impractical. The BN-600 pool-type breeder, which is half the size of American commercial nuclear plants, has run well since 1981: it is the reactor that heated water for Walker Cisler's bath. The Russians are scaling back their plans, however. A Soviet review of the country's program in 1979 noted "greater than expected" problems with fast breeders, especially in handling sodium. It said, "As a result, the date [first thought to be in the early 1980s] at which powerful commercial fast-neutron reactors would be developed has been moved back to the end of the century," and power production may occur "only in the next century." As in the United States, reprocessing has been postponed because "demand for nuclear fuel has decreased," and re-use of plutonium in light-water reactors is "difficult to justify."

The Japanese began to operate a small test breeder in 1977, and they want to complete a Clinch River-sized demonstration breeder, the Monju, by the late 1980s. (Monju Bodhisattva, the left-hand attendant to Sakyamuni Buddha, symbolizes wisdom. The name was chosen to emphasize that the breeder program should "harmonize spirituality and science" in order to succeed.) A 1,000-megawatt breeder is also being planned there now; although the first two breeders used the loop strategy, this proposed commercial-sized plant may employ a pool, because of its superior resistance to earthquakes and the successful experience with pools of the French and the Russians. Some analysts fear that the Japanese could use a breeder to develop nuclear weapons, although it is official policy that Japan does not want a nuclear arsenal.

Britain and Germany are also interested in breeders. Britain began running a 15-megawatt breeder on the northern tip of Scotland in 1959, and started up a 250-megawatt breeder in 1974: it "closed the fuel cycle" by reusing some of its own fuel last year. Sometime this year, Britain may decide whether or not to build a demonstration-sized breeder of 1,320 megawatts.

Both Britain and Germany hesitate to build new breeders at the moment, because the utilities are unwilling to take on the costs until the plants are known to be reliable, and the governments are unwilling to run the plants themselves. The German parliament may decide soon whether or not to continue funding Germany's second breeder, a 300-megawatt plant at Kalkar, even though it is nearly completed. The utilities have balked at paying unexpected costs incurred during construction. As Otto Keck, who has written a book on German breeders, points out, "government laboratories and agencies are not well equipped for economic assessments."

Keck's description of Germany's dilemma sounds in many ways like an analysis of Clinch River's politics. He says, "Industrial firms do not necessarily communicate the full scope of their assessments to policymakers. They do not wish to exclude themselves from a government-financed program by questioning the government's economic justification. Their interest is to be part of the program in order to know what is going on and to get some of the business involved."

The Clinch River plant represents only about one third of a $600-million-a-year expenditure, and if it is scrapped, an expensive U.S. breeder program will still exist. The EBR-2 and the FFTF will still be testing breeder fuel in northwestern deserts. Other federal programs will still be concentrating on the sodium pumps and steam generators that have confounded the builders of every breeder. But all this, as Floyd Culler, of EPRI, has said, will lack a "focal point." Some other machine is sure to be proposed to prove that so much money and effort have not been wasted. Besides EPRI's plans for a large breeder, $30 million has been committed by the government in the past two years to fund a study of what the next breeder—the so-called "LDP"—should be.

Given the fragility of geologists' estimates of reserves, no one can say with any authority precisely when in the distant future coal, oil, and uranium might run out, but the ultimate need for some alternative energy source must be reckoned in anticipation of their depletion. For now, analysts in the government and the nuclear industry are taking advantage of the hiatus brought about by the absence of any new orders for nuclear plants to reassess the future of nuclear power in meeting that need. A robust revival of the light-water nuclear-industry must occur in order for breeders to have a role.

Whether breeders are needed or not, a growing number of scientists seem prepared to forget about them. Teller says, "For thirty-seven years, most of the nuclear physicists considered the breeder as the front-runner, as the wave of the future. They put only the most money on it but also the most ingenuity. They solved a few problems, yet we don't have an economical breeder. The French seem now to have less confidence in their economic success than they used to have. And I like to say, perhaps a little maliciously, that the Superphenix will be a big success—just as big as the Concorde."

Teller says that "the long time, the big effort, and the lack of obvious success are clear points that argue stop and look." Some of those present at the breeder's creation have already stopped and looked, and what they have seen is a dream turned to obsession. They have turned to new dreams—perhaps not as grand as the breeder and its "plutonium economy," but probably not as dreadful, either.

Until three or four years ago, the breeder seemed inevitable, but, for all its promise, it has become instead a costly disappointment. George Weil, an early colleague of Enrico Fermi's who was at the controls when the Manhattan Project scientists created the first chain reaction, and who, for a time, supervised reactor development at the AEC, thinks the breeder has lived up to the dreams of the ancient alchemists, after all. Well says, "So far, it's only been good for one thing—breeding money."●

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Senate

CLINCH RIVER—FOREIGN CONTRIBUTIONS HIGHLY UNLIKELY

● Mr. HUMPHREY. Mr. President, on March 15 the Breeder Reactor Corp., which represents those utilities that have contributed to the Clinch River breeder reactor project, issued a report suggesting how the Department of Energy (DOE) might find new funds for the project. One of the six approaches the Breeder Reactor Corp. suggested was to secure "additional foreign R&D commitments." Unlike the other five options, though, this financing idea was not explained or detailed.

I believe this omission was no accident. Indeed, in a separate study recently done by the Congressional Research Service, the Office of Senior Specialists concluded that foreign cooperation in the funding of Clinch River was most unlikely.

Although one can get a better understanding of the Service's finding by reading its entire report, "Prospects for Future American, British and Japanese Cooperation on Fast Breeder Reactors: A Preliminary Analysis," the study's conclusion alone is quite forceful and suggests how foolish it is to think someone else is about to bail out the Clinch River project. Mr. President, I ask that the complete text of this conclusion be printed in the RECORD.

The material follows:

PROSPECTS FOR FUTURE AMERICAN, BRITISH, AND JAPANESE COOPERATION ON FAST BREEDER REACTORS: A PRELIMINARY ANALYSIS

PROSPECTS FOR FUTURE COOPERATION

On the basis of the preceding discussion, it is clear that there has been extensive cooperation among the American, British and Japanese breeder programs. However, this cooperation has largely been limited to exchanges of information and personnel, and to joint experiments primarily focused on fast reactor core design, fuel development and safety.

Cooperation at this level can be expected to be maintained, and perhaps increased in the foreseeable future. Moreover, despite numerous difficulties and potential problems, there appears to be considerable interest in Japan, the United Kingdom and the United States for higher levels of breeder cooperation, perhaps involving construction of a commercial-scale demonstration plant. As we have seen, such cooperation has been specifically discussed by the Americans and the British since the late 1970s. In addition to the reasons why each individual country may favor such cooperation, it would clearly stimulate the programs of all. Japan and the United Kingdom in particular could benefit from U.S. involvement, which would heighten the credibility of their breeder program by providing a U.S. imprimatur for their national nuclear paths.

Currently, bilateral negotiations are apparently going on between all three parties, albeit the alternatives they are considering and their status is not public. Higher levels of cooperation could be achieved between the United States and either the United Kingdom or Japan, or both. But this appears highly unlikely at this time. Before further cooperation could be achieved, a complex web of technical and financial difficulties would have to be resolved. Among other matters, the economic and technical contributions of each party would have to be determined, and a multitude of patent, proprietary, siting and licensing issues addressed. Moreover, domestic political conditions conducive to such a cooperative venture would have to be created. For, at this time, higher levels of cooperation would probably be intensely opposed by powerful anti-breeder coalitions within Congress and without, and possibly also by some breeder advocates.

The tasks confronting the proponents of further breeder cooperation are immense, and are complicated by divisions within each of the countries. It is not clear that the United States, for example, will develop a cohesive negotiating position on an interagency basis and implement it in a coordinated manner. There appears to be divisions within the U.S. Government on the potential impact of a cooperative venture on the Clinch River Breeder Reactor, with some proponents of CRBR fearing further cooperation could adversely affect its funding and completion, and others arguing that a cooperative breeder venture will instead be supportive of CRBR. It is not clear whether Japan and the United Kingdom would experience similar problems, but this is not unlikely.

Overall, then, the prospect for further breeder cooperation among the Japanese, British and American Governments is not great, despite mutual interests in, and ongoing efforts to realize, such cooperation ●

United States of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

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Senate

CLINCH RIVER—NOW THE PRESIDENT'S OWN SURVEY SAYS NO

● Mr. HUMPHREY. Mr. President, on April 5 the President's private sector survey on cost control, a blue ribbon survey that tapped private business' top economic and research and development minds, issued its report on Federal energy policy. Chaired by the President's friend, Mr. J. Peter Grace, of the W. R. Grace Corp., the survey concluded after careful study that it was inappropriate for the Federal Government to fund demonstrations of existing technology. As the survey's report made clear:

> Federal R&D responsibilities do not call for the demonstration of existing technology as a major step toward commercialization, because that step should be taken by the private sector whenever it deems the time is ripe.

Why were such demonstration projects inappropriate for Federal backing? The survey explained:

> Government laboratories have neither experience nor any special capability in commercializing products or technologies. Without guidanace, it may be difficult for them to determine the point at which private sector payoffs are close enough to justify yielding entirely to free-market forces; yet there is a natural inclination to continue programs once they have been undertaken.

The President's survey, though, went beyond generalizations. It offered two key examples: The Clinch River breeder reactor project and the gaseous centrifuge enrichment project (GCEP). Of these projects the survey noted, "Each involves the prospective investment of additional billions within the next few years, and each should be reviewed." Indeed, cutting each of these projects would make it "possible over the next several years to reduce budget outlays dramatically and/or to redirect Federal research expenditures into more appropriate and broadly productive areas."

More important, neither project, according to the President's survey, truly falls within President's "implicit guidelines for justification as R&D programs." Certainly, the Clinch River breeder reactor project could "only be regarded as a facility to prove commercial feasibility." And GCEP, which "represents a scale-up of existing technology to commercial operation . . . needs to be considered on economic grounds." The survey emphasized:

> From the domestic private sector standpoint, the timing does not appear right for commercialization in either case.

Indeed, the President's survey rejected the Department of Energy's contention that the Clinch River breeder reactor project is truly research and development:

> The status of CRBR as a research and development project is rendered somewhat suspect by proponent claims that the revenue from the sale of electricity will more than offset its construction cost if the plant is completed and continues to operate through the year 2020; the implication that it could somehow become a money-maker is denied by independent analysis.

This then brings us to the survey's conclusion:

> If scale-up for the purpose of demonstrating commercial feasibility is to be managed and financed primarily by the private sector, such projects as the CRBR and the GCEP fall outside the realm of R&D projects, and—if pursued at all—should be funded by other means.

The President has gotten good advice here. Now the question is whether or not we are capable of taking such advice ourselves. It is essential that we do. Terminating the Clinch River breeder reactor project is long overdue.●

United States
of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE *98th* CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, MONDAY, APRIL 18, 1983 *No. 49*

Senate

CLINCH RIVER—A KEY PROPONENT FALLS OUT

● Mr. HUMPHREY. Mr. President, recently, in the American Nuclear Society publication Nuclear Report, the Clinch River breeder reactor project and the prospects of establishing alternative financing for it received special attention. In the latest issue dated April 7, an in depth interview was featured with Congressman ROBERT WALKER, ranking minority member of the House Science and Technology Committee's Subcommittee on Energy Research and Production.

Congressman WALKER is no opponent of nuclear power. Indeed, before 1982, he voted three times to fund the Clinch River project. Over the last 6 years on the Energy and Research and Production Subcommittee, though, he has become increasingly skeptical of the Clinch River project. In his interview Congressman WALKER rejected the argument that Clinch River was essential to the Department of Energy's larger long-term base breeder research and development program. He also was concerned that what others are now calling cost-sharing proposals for Clinch River appear to be nothing more than elaborate money shuffles.

Finally, he made it clear that the bottom line with the Clinch River project was whether or not it would clearly save the taxpayer money over the long haul. Will it save such money? Congressman WALKER's answer, as his own vote last December against further funding of the project clearly suggests, is no. Mr. President, Congressman WALKER's interview comments on the Clinch River project are quite balanced and particularly relevant as Congress is now considering whether or not to fund the project for fiscal year 1984. I ask that the interview be printed in the RECORD.

The interview follows.

NUCLEAR REPORT

(Exclusive interview with Representative Robert Walker (R., PA), ranking minority member of the Subcommittee on Energy Research and Production, Committee on Science and Technology.)

Q. Where do you stand on nuclear power?

A. I've generally been a supporter of nuclear power. My attitude is shaped as someone who is a nuclear proponent. Where I see the problems arising for the nuclear industry is in the fact that there has not been a positive response to things like Three Mile Island. I think the industry waited far too long in helping to resolve that situation and gained for itself an awful lot of adverse reaction and adverse publicity that need not have been. I'm also concerned about the economics of nuclear power. I think that over the long haul, the pattern of nuclear activity in the country will be governed by whether or not utilities are going to be able to buy plants at a cost that they can justify to the ratepayers. That gets us into a whole myriad of questions of what we should do to assure that costs are either stabilized or even lowered on a per-plant basis, whether by standardized plants or other issues that are going to take a priority if cost considerations are to be the primary considerations for the rest of this century. This brings me to the R&D area and to some of the things the Subcommittee is engaged in.

Q. How about Clinch River? You voted three times in a row for the project, but last December you switched. Why did you do that?

A. My problem with Clinch River primarily relates to cost, because I think that the technology is probably the most advanced that the world has to offer in this particular application. My objection in December was over the cost factor and how it relates to the amount of money we are putting into nuclear energy research as a portion of how much we are spending on all energy research. What percentage of the overall energy budget is being eaten up today by one project alone and what percentage of our monies in the future will be eaten up by the same project. Can that one project be justified in terms of its value as something which is no longer taking 10% of the money but is taking 20-25, ultimately 30% of the monies that we have available in the research area.

Q. Have you actually made these calculations?

A. The administration's FY-84 budget for CRBR is only 12% of the total energy R&D budget. Understandably, but my point is that we can continue breeder research and we can continue to push the frontiers of our knowledge on breeder research without building the project and thereby bring down the cost in this particular area. Maybe breeder technology is something in terms of research dollars that's important for us to keep a base of knowledge about, but when you are talking about one project eating up a substantial portion of all your energy R&D dollars, I think we must take a serious look at it. That's when I finally came to the conclusion that, with declining amounts of money in that area, we can no longer afford that one project.

Q. Will Congress support even the base breeder program and international cooperative efforts if there is no promise for a commercial breeder in this country?

A. If I am speaking for myself, the answer is yes, and I am of the opinion that many of the Republicans who peeled off on Clinch River in December would also support a base breeder program being maintained, and they would also support a cooperative effort toward international development of specific breeder technologies. I think a far stronger case can be made for that in the R&D area than you can make for the Clinch River project.

Q. Have you studied the new alternative financing proposal for Clinch River?

A. I haven't had a chance to study it very carefully. The briefings I have had on it so far indicate that it doesn't yet include anything very substantive. It involves more in the way of creative financing than it does in restructuring of actual commitments by the industry. If, in fact, that's the case, I'm not certain that it will be any more popular with the Congress than the old proposal. What I'm saying is this: From the initial briefings I've had, it sounds as if they have come up with some ways of appearing to put more money in without actually putting more money in. Nonetheless, we will conduct a series of hearings on the matter. That's one of the reasons why we separated CRBR out of our considerations at the Subcommittee level so we can look at the new proposal as a singular kind of subject. If I can be convinced that there is more substance to it than there now appears, I'm perfectly willing to look at it. However, if all we are doing is shuffling figures around, then I will have to come back to the cost question that caused my concern before the December vote and continues to cause me concern.

Q. If Ronald Reagan telephoned you personally saying we need to

A. demonstrate breeder technology at Clinch River would you be strongly influenced to vote for it? Probably not. I try to listen to the President, and I think he would regard me as one of his more solid supporters on Capitol Hill. But he also realizes that I pursue independent economic and energy philosophies and that my first obligation is to my constituents. My constituents sent me down here to evalute things in terms of the overall economic policies of the country. One of the things they are asking me to do is to find ways of cutting government spending. I think we have done some of that in the energy R&D area. We have actually trimmed some real dollars in some areas, and we have dratically stemmed the rate of growth in certain programs. I have to look at each proposal before me in the terms of that overall perspective. Ronald Reagan does the same thing. He and I may arrive at the same policy direction, but we have different specifics in doing so. If Ronald Reagan could convince me in a phone call that what we were doing was actually saving the government money over the long haul—that we were getting the technology at less cost—that might make a difference. If he's simply telling me that we have to have this project, then I think I know as much about it as he does, having dealt with this particular subject for six years on the Committee. Thus, I would have to make my own assessment based upon the base knowledge that I start with.●

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PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

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Senate

CLINCH RIVER—ALTERNATIVE FINANCING, NOW A NEW COST

● Mr. HUMPHREY. Mr. President, late last December after funding for the Clinch River breeder reactor project was defeated in the House and sustained by only one vote in the Senate, the conference instructed the Department of Energy (DOE) to examine ways Federal funding of the project could be reduced by increasing private sector support. On March 15 of this year, DOE issued its findings.

Ironically, the press has referred to DOE's proposals as cost sharing ideas. They are nothing of the sort. Indeed, there is every reason to believe that DOE's alternative financing proposals will end up costing the U.S. taxpayer more than if Congress simply appropriated money for the project outright.

How could something so perverse occur? Simple: The proposals DOE has offered to reduce Federal appropriations in the near term do so only by giving away long-term tax breaks and guaranteed revenues of far greater worth to the investors than the money they put in. Such schemes may succeed in making it seem as though the project's cost to the Federal Government has been reduced, but it is a ruse and is no way to save the taxpayer money.

On March 28 and April 16 the Washington Post ran two lead editorials criticising this sort of creative financing and specifically mentioned DOE's Clinch River proposals as prime examples of what Congress should avoid. Mr. President, I ask that these editorials be placed in the RECORD along with the March 15 report on alternative financing for the Clinch River project that DOE sponsored.

The material follows:

[From the Washington Post, Apr. 16, 1983]

LEASE-BACK MANIA

Hardly a day goes by without new tales of extraordinary financing schemes undertaken by governments and nontaxable institutions to attract private investment. The key ingredient? Heaps of tax breaks costly only to the federal treasury and contributors thereto.

All of these schemes operate in basically the same way. The non-taxable agency or organization arranges to have a private group buy or construct some big-ticket item. The nominal owners, being taxpayers, can claim one or more tax benefits such as accelerated depreciation, interest deductions and investment tax credits. The nontaxable organization then signs a long-term lease at a discount reflecting some share of the leaser's tax benefits. The leasers are happy because their tax bill has been reduced at no risk, and the agency is happy because its budget looks lower. But the federal Treasury pays a substantial part of the bill in lost revenue.

The idea is flourishing. That troublesome new NASA satellite just deployed by the space shuttle turns out not to be owned by NASA—at least not for tax purposes. The shuttle budget looks smaller than the true cost to taxpayers. Rural electric cooperatives assisted by the Rural Electrification Administration are getting into the game. The Clinch River Breeder Reactor may be sold and leased back. The Navy wants to "charter" customised cargo ships and the Air Force wants to lease 39 executive jets and assorted transports. Anyone want to buy a missile silo and rent space to the MX program?

State and local governments? Sale-leaseback deals are becoming the preferred method of financing many development projects. Atlanta, for example, is considering selling its historic city hall; private developers will renovate, enlarge, and lease it back to the city. The developers get the tax breaks, the city gets a deal on the rent, and Uncle Sam picks up a large part of the tab. Similar deals around the country involve museums, convention centers, schools and sewer systems.

The renovation of the Torpedo Factory in Old Town Alexandria is a state-of-the-art example. There, the private developers will take advantage of industrial development bonds, the investment tax credit, a special tax credit for rehabilitating old buildings, and accelerated depreciation. Bennington College is considering selling its campus to a group of friendly alumni, and leasing it back. The purchase price paid by the alumni becomes, in effect, a loan made inexpensive for the college because of tax breaks available to the alumni, at the federal Treasury's expense.

This is all absurd. Neither touristy torpedo factories nor college campuses should receive these extra helpings of invisible, unfocused taxpayer largess. And the issues of control and accountability become critical when the property involved is city hall or a Navy ship. This burgeoning tax avoidance industry is attributable in part to higher bond interest rates that make borrowing more expensive to local governments (there's too much state and local government debt floating around), and in part to the extremely attractive depreciation provisions in the 1981 tax act. Plugging this drain on the Treasury should be high on the agenda.

[From the Washington Post, Mar. 28, 1983]

LEASE-A-GOVERNMENT

When the Navy Department decided recently to lease rather than buy 13 custom-tailored cargo ships, it was cashing in on a growing trend in government financing. Not only federal agencies, but local governments as well are finding that lease-back deals with private investors can make their budgets look considerably smaller. The catch is that the hidden costs show up as lost revenues to the federal Treasury, an addition to the deficit that Congress cannot now control.

Leasing routine services and equipment is a perfectly legitimate and efficient practice for government agencies in cases where the item in question is needed only sporadically or for short periods of time. The practice becomes suspect, however, when it is extended to such quintessentially governmental properties as naval ships, fire stations or city halls, and the transaction ends up costing the taxpayer more money than it saves.

Leasing is attractive to governments because then can pay for the things they need in installments rather than having to justify their full costs when they are initially bought. A municipality can thus avoid having to persuade voters to authorize a new bond issue, and a federal agency can avoid a fight with an authorization or appropriation committee.

The government can also lease the item in question at an apparently low price because the private investors, unlike the government, can claim substantial depreciation deductions against the taxes they would otherwise pay. Part of the true cost of the purchase is thus passed on to the federal Treasury in the form of lower revenues. The whole thing ends up costing the taxpayers more than a straight-out purchase because the investors and other intermediaries involved in the deal want some profit in return for their participation.

Rep. J. J. Pickle, chairman of the Ways and Means oversight subcommittee, has been looking into tax-leasing deals at all levels of government. He notes Joint Committee on Taxation estimates that the cargo ship-leasing deal will cost taxpayers 12 percent more than a direct purchase and disguise 30 percent of the true cost.

Similar hidden losses can be expected from other administration "privatization" schemes, such as the sale of weather satellites and the Clinch River Breeder reactor. Even larger taps on the Treasury can be expected as local governments extend their use of tax-leasing and other innovative forms of tax-exempt financing to shift both municipal and private development costs to the federal government. If Congress wants to narrow the federal deficit, it will have to stop what could become a massive and uncontrollable drain on federal revenue.

[Report of Mar. 15, 1983]

EXPLORATION OF ALTERNATIVE FINANCING POSSIBILITIES FOR THE CLINCH RIVER BREEDER REACTOR PROJECT

(A task force report to the Breeder Reactor Corp. on alternative financing possibilities for the CRBR project.)

I. COST TO COMPLETE

Under the May 4, 1976 Project Agreement, the DOE is obligated to use its best efforts to obtain from Congress whatever additional funds are needed to complete the Project and demonstrate the technology.

The Task Force was asked by BRC to explore alternative sources of Project financing and to advise BRC whether such alternative sources, when coupled with continuing Federal appropriations at roughly present levels, will be adequate to complete the Project. The Task Force did not make an in-depth examination of the Project schedule and costs, but was provided with DOE's latest construction schedule and cost estimates which indicate that the CRBR Project can be completed by October 1989 at an estimated remaining expenditure of $2.4 billion after FY 1983. These estimates assume that the construction schedule is not constrained by further funding limitations. Thus, the completion date and remaining expenditures are highly dependent upon resolution of existing funding uncertainties. If the construction schedule were to slip, the estimated remaining cost to complete the Project could increase significantly.

For purposes of this report, the Task Force accepted DOE's estimate of $2.4 billion to complete the Project, assuming that further delays will be avoided; and recognizing that this assumption (and, hence, the cost estimate itself) depends upon prompt actions relating to the resolution of Project funding.

The deleterious effect of delays.—It is enormously costly to delay or stretch out any large construction project, particularly a large R & D project, such as the CRBR Project, due to additional carrying charges during the delay period, escalation of construction costs, and added expenditures associated with using less than optimal construction forces. Members of the Task Force have had direct experience with such delays and, accordingly, all of the projections in this report assume prompt Federal action, including timely future funding by the Congress, so as to permit optimal work scheduling from this point on. Absent these, the conclusions of this report cannot be supported.

II. NEW-SOURCE FUNDING NEEDS

Future contributions from the electric utility industry, already committed, will provide $172 million, and other contributors will provide $5 million, for total future contributions of $177 million. While part of these contributions are scheduled to be made after FY 1991, it is assumed that all such amounts can be made available for funding Project construction plus interim financing costs, to the extent they must be paid currently.

Assuming minimum future Federal funding at roughly current levels for a total of $1.4 billion subsequent to FY 1983, the additional amount required to be provided from new sources, in order to fund total Project costs, would be about $800 million, as shown in the following table:

TABLE I.—*Remaining capital requirements*

	Billions
Federal funding	$1.4
Utility contributions and others	0.2
New-source funding required	0.8
Total funds needed	2.4

Adding a modest allowance of $300 million for those out-of-pocket financing costs which must be paid during the construction period, an estimate of $1.1 billion seems reasonable for the Project's future new-source funding needs, but this amount can vary widely, depending upon the financing plan selected.

III. NEW-SOURCE FUNDING REQUIREMENTS EXCEED THE PROBABLE PROCEEDS OF A SALE OF THE PROJECT ITSELF

The maximum future market value of the CRBR Project, measured in terms of the likely avoided cost of constructing alternative coal-fired units equipped with scrubbers, is not expected to exceed $2,300 per KWe.[1]

If the 330 MWe conservative net rating of CRBR were priced at $2,300 per KWe, the result would be $750 million. If the 380 MWe design net rating were priced at $2,300/KWe the result would be nearly $900 million. However, the facility is worth less than that today because achievement of a commercial level of reliable operation is at least nine years away. Moreover, steps must be taken to reduce completion risks and the like before Bankable[2] securities can be sold and full market value realized.

IV. POWER SALES CONSTRAINTS

Studies show a probable need for additional electric generating capacity in the SERC region in the early to mid-1990s. However, utilities in that region may be reluctant to assume certain risks associated with long lead-time commitments for CRBR power, namely: projected load growth in the SERC region may not materialize; the level of power revenues needed to pay project debt service and other financing costs may exceed the purchasers' "Avoided Costs;"[3] and the project may not be able to produce the power contracted for.

Regulated electric utilities tend to be inhibited from making risky long-term capacity commitments because the regulatory penalties for over-commitment are severe. In view of the possibility that such penalties might be imposed, regulated utilities in the SERC region may be reluctant to enter into long-term obligations today (i) to purchase minimum annual quantities of CRBR power, or to purchase the clinch River Project itself (or the Balance of Plant, i.e., the Project excluding the Nuclear Steam Supply System) because anticipated load growth might not materialize; or (ii) to pay a specific minimum price of CRBR power because that price might prove to be in excess of their systems' Avoided Costs.

Nevertheless, the Task Force is confident that, if appropriate arrangements are developed, such reluctance can be overcome. However, the very existence of such reluctance is evidence of the need for the kinds of assurances deemed essential, as discussed below.

V. RANGE OF POSSIBLE MARKET VALUES

The CRBR Project will have significant potential maket value when completed and the plant is operating as a base-load electrical power plant. Realization of that value prior to the end of the shakedown period (now scheduled for mid-1992) will depend upon unconditional Federal assurances, as discussed below. Such realization may be accomplished in a variety of ways, as follows: sale of the project, sale of the balance of plant (BOP), accompanied by a viable steam supply contract, and pledge of the future revenue stream.

Sale of the project.—As a practical matter, it would be difficult to sell the entire Project today (or to sell securities approaching its full value) because the accident at Three Mile Island and the controversy surrounding the Washington Public Power Supply System (WPPSS) nuclear program have left investors leery of large nuclear power plant projects, whether or not they are backed by apparently firm govenmental assurances. This suggests that the inherent value of the plant itself would have to be supplemented by a long-term power sales agreement backed by an unconditional Federal warranty of minimum revenues.

Setting aside, for the moment, the value of the revenue warranty, it is reasonable to assume that the Project itself may ultimately be worth as much as the coal-fired capacity which would otherwise have to be built. Applying the $2,300 per KWe figure already mentioned to the full 380 MWe net rating of the Project indicates that the maximum capacity value of the Project may, in 1992, approach $900 million. The tax benefits normally associated with plant construction and ownership would provide additional value which, however, cannot be quantified at this time.[4]

Sale of the BOP.—The BOP would have little market value without an assured supply of steam. A contract to supply such steam at an assured price per Kwh would be essential if the BOP were to be sold for a significant amount. A long-term power sales agreement backed by Federal assurances would also be required. The amount for which the BOP could then be sold would depend, of course, upon the terms of those two contracts. Assuming that the steam contract were designed to maximize the value of the BOP, then the BOP might be sold for a significant figure, not because of its replacement value in terms of turbine generator condenser, switchgear and the like, but because of the value of the future net revenue stream (after deducting steam supply costs), coupled with construction-related tax benefits already referred to.

A simple pledge of the warranted future revenue stream.—The value of the future power output of the Project will vary depending upon the amount of assured output and the net revenue per Kwh available to cover debt service and equity return. For example, minimum net revenues of 6 cents per Kwh (after deducting fuel, other operation and maintenance expenses) on an assured annual output of two billion Kwh for 20 years beginning in 1992 would provide $120 million a year, an amount adequate to pay the debt service (and equity return), at an assumed 10 percent annual cost of money,[5] on approximately $1 billion invested in 1992—$1,020 million. A minimum net price of 6 cents per Kwh does not seem unreasonable for the 1990s and thereafter, in terms of Avoided Cost projections for SERC region utilities which have committed their 1990s capacity needs. However, bus-bar electricity cost projections from new coal-fired units in the SERC region for the 1990s and thereafter are in the 15 cents per Kwh of higher range. If net revenues pegged at this level or modestly lower could be assured through firm DOE contracts, significantly larger amounts could be provided.

It should be emphasized that to be Bankable, the power contracts must be the hell-or-high-water type. In short, they must guarantee the payment of annual dollar amounts adequate to cover financing costs no matter what happens.[6]

In setting forth the foregoing range of 1992 values, the Task Force avoided pinpointing a precise value because it will depend upon the character of the arrangements provided. However, several relevant observations can be made:

(1) It appears that the market value in 1992 (for investment purposes) may be in the range of $1 billion.

(2) If the Project or the BOP is purchased by investors, the investment value can possibly be enhanced through conventional construction-related tax benefits, viz, those associated with amounts invested in newly-constructed depreciable property.

(3) The amount of funds which can be made available to cover actual construction expenditures will vary widely depending upon when the money is actually invested. For example—

The proceeds of a $1 billion investment in 1993, if invested in 1983 with no interest or other return payable for ten years, would provide useable funds (in 1983) of only $385 million, assuming 10 percent annual cost of money.

If the funds are invested in 1988, the net amount thus available (again assuming no interest or other return payments until 1993) would be $620 million.

Alternatively, if the funds are invested in four equal annual amounts, from 1986 to 1989 inclusive, such investments would amount to $150 million a year for a total of $600 million.

Given the range of possible investment values arising from varying revenue streams, tax considerations and present value discounting, a carefully worked-out plan will be required to thread one's way through the array of opportunities and obstacles confronting the Project financing. The Task Force stands ready to assist in developing acceptable arrangements for capitalizing on the future market value of the CRBR Project in order to obtain significant financial support for the Project.

VI. SUGGESTED PLANS TO CAPITALIZE ON THE VALUE OF THE PROJECT

The future market value of the CRBR Project can be capitalized on, if, and only if, the licensing, completion and operating risks are eliminated through prompt Federal action. Also, appropriate fuel supply assurances must be provided and private investors assured that future revenues will be adequate to earn an appropriate return on, and return of, their investment.

As indicated in the foregoing Sections, several approaches are feasible:

(1) Straight-forward borrowing based upon future power supply contracts.

The DOE might contract to purchase the entire CRBR output for use in its uranium enrichment plants, with annual payments sufficient (net of operating costs) in any event to pay the debt service. That contract could then be pledged as security for a long-term loan.

Alternatively, the DOE might warrant that the CRBR will produce a minimum amount of power and provide price supports such as those proposed for synthetic oil in the mid-1970s when the Government offered to provide such oil at a support price for resale to user utilities. There is ample precedent for price support in Public Law 96-294, the Energy Security Act. Such price supports should be adequate to cover all debt service requirements.

(2) Sale of Partnership equity interests and debt securities of an entity which would purchase and own the entire CRBR Project.

To be marketable, such Partnership equity interests would require broad Federal assurances as to the deliverability of a reliable and acceptable facility.

Long-term power sales contracts (like those described under (1)) would also be required.

In order to realize the full extent of available tax benefits, favorable IRS rulings would would be essential.

(3) Sale of Partnership equity interests and debt securities of an entity which would purchase and own only the BOP.

This approach would require all those items discussed under item (2) except that BOP operating risks might be assumed by the owners.

In addition, an acceptable steam supply contract would be required because, without such a contract, commercial viability cannot be assured.

With appropriate contractual provisions, this approach may be the best way to maximize the tax benefits associated with the Project.

Conclusion. Under any of the foregoing plans, it would be feasible to work out arrangements so that payments received for the future value of the Project or the BOP would be adequate to provide significant investment support.

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[1] Generation in the Southeastern Electric Reliability Council (SERC) Region, outside of Florida, is predominantly coal-fired. The $2,300 figure is derived from a range of estimates available from several sources for base-load coal-fired capacity installed in the SERC region for commercial service in 1992 (the earliest date at which commercially reliable output is expected to be available)—in short, ten years hence—and using annual cost escalation rates in the 8 to 9 percent range.

[2] The terms, "Bankable" and "Bankable Commitments", as used herein, mean that the contract or obligation in question is sufficiently firm to provide adequate security for non-recourse loan, advance, leasehold investment, or equity participation.

[3] "Avoided Costs" is a technical term derived from Section 210 of the Public Utility Regulatory Policies Act (PURPA). Section 292.101(b)(6) of the regulations implementing that Act defines "Avoided Costs" as follows:

"(6) Avoided Costs" means the incremental costs to an electric utility of electric energy or capacity or both which, but for the purchase from the . . . qualifying facilities, such utility would generate itself or purchase from another source."

The PURPA regulations generally provide that electric utilities must pay full avoided costs for electricity generated by small power producers and cogenerators.

[4] There should be no net loss to the Government through the use of CRBR of existing construction-related tax benefits. This is because any such benefits used in connection with the CRBR will displace those that would otherwise have applied to new capacity displaced by CRBR.

[5] The precise interest rate applicable to the financings referred to above and hereinafter would depend upon market conditions when such financings were arranged. In today's market, a 10 percent annual rate is on the optimistic side. However, other assumptions set forth herein tend to be on the conservation side.

[6] With moderate economic growth over the long-term, new capacity is expected to be required in the SERC region. Thus, while firm utility contracts to purchase power at displaced capacity rates will be difficult to achieve in the near term, as future capacity needs become clear such contracts may be forthcoming. Thus, while Federal revenue assurances will be needed in the near term, the Government might not have to pay on such assurances unless, of course, the expected economic growth and capacity requirements do not materialize when needed.

VII. OTHER APPROACHES TO FUNDING CAPITAL REQUIREMENTS

The only other way to obtain significant additional capital funds from private investors would be to provide other assets or potential benefits adequate to assure that the investor will get something of value in return and be compensated for risk.

Potential "assets" not already discussed fall into six categories:

(1) Assurances that private investors will recover their investment and the cost thereof if timely Federal appropriations are not provided, and that annual appropriations will be continued if the Project is delayed.

Such a commitment would assure investors that the Federal Government intends to see the Project through to completion despite past uncertainties.

It would also facilitate interim financing during periods of peak construction expenditures.

(2) Additional tax incentives, similar to those associated with any large capital-intensive R&D project.

Such tax incentives would not be a windfall for investors; instead, they would be designed to provide additional "value" which the Project can offer in exhange for funds invested. For full discussion, see the appendix prepared for the Task Force by tax counsel.

(3) Other source of funds.

Possibilities include additional warranties by maufacturer/vendors and architect/engineers and additional R&D commitments from manufacturer/vendors and architect/engineers, or the domestic electric utility industry. Local regulation and the controversial nature of the CRBR Project would make it very difficult to raise such funds from either the regulated electric utility industry or the Electric Power Research Institute. Any attempt to do so might well jeopardize existing CRBR funding arrangements.

(4) Additional foregin R&D commitments

(5) Licensing revenues, based upon potential patent rights.

Action would be needed to protect breeder R&D from reaching the public domain and make potential worldwide licensing revenues available to support CRBR Project financing.[7]

(6) Direct Federal assurances.

If other financial mechanisms are inadequate, the alternative may be for the Federal Government to act as a "deep pocket" guarantor of Project debt, lease obligations and equity returns.

The foregoing Sections outline an array of financing alternatives which are available to the CRBR Project. While the Task Force prefers no single financing approach, the following Sections describe in broad terms one possible financing program which seems promising.

VIII. POSSIBLE FINANCING ENTITY

The CRBR Project is faced with the need for significant funds; and without specific legislation, it would be unable to obtain such funds.

Such legislation may be needed to provide necessary warranties and tax incentives. It is also needed to create a financing entity which can use those warranties and incentives.

That entity can take several forms but, in any event, it should be designed to bring the Federal Government and a group of private investors together in a single enterprise so as to enable completion (through combined Federal/private financing) of an important R & D facility on which more than $1.5 billion has already been spent and which it would be foolhardy to junk.

Accordingly, the following format is suggested as a basis for further study and review:

(a) Its name: whatever it is finally named, it is hereinafter referred to as the "Partnership."

(b) The form: A public/private joint venture, created by Federal statute, encompassing both Government and private investment capital.

(c) Partners would include a newly created Federal corporation (or the DOE) as general partner and a group of private investors as limited partners.

(d) The limited partners might be individuals, corporations, or partnerships, depending on tax and regulatory considerations.

(e) The Partnership would be entitled to receive and allocate tax benefits among its partners.

(f) Ownership of the Project should be vested in the Partnership. Care should be taken not to disturb present licensing arrangements, but the Partnership should be provided with enough of the characteristics of ownership so that tax deductions and credits can be allocated among the limited partners.

(g) TVA would operate the Project and wheel power produced pursuant to a keep-whole reimbursement contract.

(h) At the conclusion of operations and recovery by private investors of their investment, title would revert to the Federal Government. Provision should also be made for decommissioning and waste disposal responsibility to remain in the Federal Government.

IX. POWERS OF THE PARTNERSHIP

The Partnership should have the following powers, among others:

To issue its own debt obligations with Federal warranties, which could include borrowings from the Federal Financing Bank (FFB),[8] and/or without Federal warranties.

To issue limited Partnership equity interests and to allocate tax benefits among the limited partners;

To pledge the proceeds from its contracts and agreements as security for its debt, lease, joint venture or Partnership obligations;

To ratify and assume obligations under existing contracts and to enter into new purchase, construction and operating agreements, to buy and sell power, to sell and lease back facilities and fuel, etc.;

To obtain and hold title to patents and to license the use of such patents worldwide;

To enter into appropriate joint ventures related to the CRBR Project;

To be exempt from the Public Utility Holding Company Act and the Federal Power Act and not to be considered a regulated public utility for any purpose, state or Federal.

X. PRIORITY ASSESSMENT OF ACTIONS NEEDED

In addition to the legislative action needed to create the Partnership with the powers set forth in Section IX, it must be given enough financial substance to allow it to function. Actions required to provide that financial substance have already been described. They are listed below, with only moderate additional amplification, because the listing is intended primarily to indicate their relative priority.

(1) Assurances must be provided as to completion, licensability and operability.

Such assurances must be unconditional if the required funds are to be obtained, especially in view of the uncertainties surrounding the outstanding WPPSS obligations.

In the event the Project is not completed, licensed and placed in operation, private investors would be entitled to recover the capital they had provided plus a return thereon.

(2) Assurances must be provided as to the amount of power the Project will produce.

(3) Power purchase contracts must be provided for the Project's full output at an assured price.

Such contracts may represent either direct Federal power purchases or third-party purchases backed by Federal assurances.

As mentioned earlier, such assurances with regard to power purchases and the price thereof have statutory precedent in the Energy Security Act where, as here, the need for future secure energy justifies such support.

(4) Provide a Bankable Commitment that adequate Federal funds (at least $1.4 billion) will be appropriated after fiscal year 1983, or, if not, that private investors would be entitled to recover the capital they had provided plus a return thereon.

The commitment should apply to the period from fiscal year 1984 through fiscal year 1990.

It should provide for additional appropriations thereafter until the Project is licensed and achieves a commercial level of reliable operation.

It should be sufficiently firm to be Bankable.

Although the Congress does not normally appropriate funds for more than a year at a time, it should empower the DOE (i) to enter into the sort of commitment described above and (ii) to borrow from the FFB or from the U.S. Treasury the funds necessary to meet such commitments.

(5) Assure that project-related tax incentives can be allocated among the limited partners, as is customary for all large construction partnerships.

These tax incentives, which are generally available to the owners of any large construction project, include investment tax credits, accelerated depreciation and the immediate deductibility of certain overhead and operating expenses.

It is customary to allocate such project-related incentives among the partners.

Consequently, the allocation of these incentives among the Project partners would in no way provide a wind-fall for investors.

All expenditures in excess of the Project's market value might be treated as R & D expenditures deductible by the limited partners. This was the formula used in 1955 to aid in financing Dresden Unit Number One (the first privately financed U.S. nuclear power reactor), whereby all expenditures by the Nuclear Power Group (a financing consortium) in excess of the commercial value of the plant were allowed as immediate tax deductions.

In case the foregoing conventional tax incentives prove inadequate to provide the capital required, a number of new approaches might be considered. For example:

A special energy tax credit might be provided, applicable solely to the Project.

The Partnership might be empowered to enter into arrangements with the City of Oak Ridge to issue tax-exempt industrial development bonds backed by the Partnership and without regard to the so-called two-county rule.

For further discussion of the matter of tax incentives, see the appendix.

CONCLUSION

The Task Force concludes that the Clinch River Project can support significant private investment, and that the present Government/private business relationship can be enhanced, to the benefit of the entire nation.

From the viewpoint of the Federal Government, the benefit of obtaining private CRBR financing would be a near-term reduction in Federal budget requirements and increased private participation in the Project. Clearly, Federal assurances, warranties, and tax incentives will be needed in order to attract private financing. However, many of the proposed assurances are contingent and would not be called upon unless the Project failed to perform as expected, or the government failed to complete the Project on schedule or the power revenues were substantially less than projected. Moreover, the Task Force assumes that the financing arrangements will reserve to the Federal Government the residual value of Project assets.

The Task Force stands ready to assist in determining how best to proceed.

Respectfully submitted,

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Lewis E. Wallace,
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Robert C. Murray,
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[7] Care would have to be taken to assure that such action did not diminish the patent rights of the BRC members under their Utility Contribution Agreements, which could jeopardize collections from such members.

[8] Alternatively, the Partnership could have the right to sell notes to the U.S. Treasury and Treasury would be obligated to purchase such notes.

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Senate

CLINCH RIVER—NOBODY WANTS TO BUY ITS POWER

● Mr. HUMPHREY. Mr. President, last Wednesday I chaired a Regional and Community Development Subcommittee hearing on the Tennessee Valley Authority (TVA) and other Southeastern utilities' interest in buying power from the Clinch River breeder reactor project.

To keep the project alive, the backers of Clinch River are now arguing that private investors might offset Federal appropriations on the basis of the revenues the plant might produce from electricity sales. What this hearing's three key witnesses made clear, however, is that nobody is interested in buying the electricity.

The first witness, William Voight, Jr., Deputy Assistant Secretary of Uranium Enrichment and Assessment from the Department of Energy (DOE) denied DOE would need any power for its enrichment plants located near Clinch River. This directly undermined the suggestion made in the DOE sponsored report on alternative financing of March 15, 1983 that DOE might use all of Clinch River's output to run these plants.

The second witness, William Willis, TVA's general manager, also rejected Clinch River's electrical output. He foresaw no need for TVA to buy Clinch River's electricity through the end of the century and made it clear that TVA was not about to increase its contribution to the project.

One other possibility suggested in DOE's March 15 report—that utilities south of TVA in the Southeastern Electricity Reliability Council (SERC) might want the electricity, was also discussed. According to DOE's report, utilities in this region would need an additional 16,000 megawatts of electricity capacity before the year 2000. DOE also estimated that Clinch River electricity could be sold for between 14 to 16 cents per kilowatt hour in the 1990's and that at this rate the plants lifetime net worth would equal $900 million.

This $900 million figure was challenged. Mr. Willis argued that the figure must be in terms of 1992 rather than 1983 dollars—a point that was not made clear in DOE's report. But the key objections to DOE revenue projections were made by the third key witness, William Chandler of the Environmental Policy Center who formerly had worked as a consultant to the General Accounting Office on TVA's power programs. Mr. Chandler detailed how tenuous DOE's projections of 16,000 megawatts of demand and of 14 to 16 cents per kilowatt hour were.

Mr. President, both the hearing and Mr. Chandler's testimony suggest that the U.S. Government may have to give Clinch River's electricity away and that consequently alternative financing for the project is likely to be a sham. I ask that Mr. Chandler's written testimony and a newspaper article of April 21, 1983 in the Oak Ridger, which reviewed the hearing's oral testimony, be entered into the RECORD.

The material follows:

[From the Oak (Tenn.) Ridger, Apr. 21, 1983]

TVA COOL TO CRBRP POWER

(By Jim Morrison)

WASHINGTON.—The Tennessee Valley Authority will likely not be a customer for the power generated by a completed Clinch River Breeder Reactor, the TVA's general manager told a Senate subcommittee Wednesday.

William F. Willis of the TVA told the subcommittee on Regional and Community Development that the authority's projected power requirements show it will likely not need to buy power from the Clinch River Reactor. Power from the reactor could go on sale in 1995, if the project proceeds on schedule.

"TVA is in no position to buy some or all the Clinch River Plant's capacity," Willis said. He also said that although TVA has an exclusive option to buy the plant, it "probably will not exercise its option."

Willis said TVA would be willing to lend support to the project by operating the plant at a charge, by "wheeling" power from the plant to purchasers outside the TVA area and by providing "facilities and experience" on a charge basis.

Sale of the electricity to the TVA or southeastern utilities was one of the suggested plans to make the project attractive to private investors. Those suggestions came in a task force report on alternative financing mandated by Congress.

TVA planned 17 nuclear power plants based on energy projections made in the 1970s, Willis said. Five plants are now operational and four more are under construction, but eight others have been deferred or cancelled due to lower projected needs.

The current Department of Energy timetable calls for CRBR completion in 1990 and the TVA will operate the plant during its five-year demonstration phase. After that, the electricity generated by the plant could be sold commercially.

Senator Gordon Humphrey (R-N.H.), a Clinch River Project nemesis, conducted the hearing and was the only subcommittee member present. Among those absent was Senate Majority Leader Howard Baker, who has strongly backed the project since Congress started funding in 1971.

A task force of representatives from the Breeder Reactor Corp. and the DOE released alternative financing proposals March 15 for the $3.6 billion project. Any potential investor would have to be assured of the financial stability of the plant, the report said. Sale of the plant or a portion of the plant's electrical generating capacity to the TVA was one way suggested to ensure investors of a return. Another suggestion offered by the task force was for the DOE to buy the power from the CRBR for use in its uranium enrichment plants in Oak Ridge and Paducah, Ky.

But Wednesday's hearing raised doubt that those suggestions could become reality.

William R. Voigt Jr., DOE deputy assistant secretary for uranium enrichment and assessment, said it is unlikely power would be needed for the gaseous diffusion plants since the DOE is looking for less expensive ways to enrich uranium, including building a Gas Centrifuge Enrichment Plant at Portsmouth, Ohio. Finally, an independent energy consultant from the Environmental Policy Institute and Center said the southeast region in general will not need additional electrical generating capacity at the time the CRBR will be seeking to sell electricity.

Voigt said reduced demand, largely due to lower-priced foreign competitors, for uranium enrichment done by the United States means the DOE does not need all the electrical power now available through long-term contracts lasting into the early 1990s. "As a result, the department will be paying capacity charges for contract power not purchased from the Tennessee Valley Authority," he added.

Long-term DOE plans call for one or more of the gaseous diffusion plants, which are less efficient than gas centrifuge plants, to be shut down as the Portsmouth facility increases its load. "There would be no need to buy power from Clinch River if the centrifuge enrichment plant goes forward," Voigt said.

Construction of the plant is still in doubt, awaiting Congressional funding.

William Chandler, director of the energy conservation project at the Environmental Policy Institute and Center also took issue with the task force finding concluding the southeast will need 16,000 megawatts of additional power capacity by 1995.

A recent study by the Congressional Research Service using a high rate of economic growth found that the southeast region will have a reserve capacity of 35 percent in 1990 and 26 percent in 1995, Chandler said.

"Revenue projections made by the DOE and the BRC on the basis of sale of electricity or the CRBRP after the initial five-year demonstration phase of the plant are extremely tenuous," Chandler said.

"The likelihood there will be no market for the power (from CRBR) undermines a key part of the (alternative financing) report," Chandler added.

STATEMENT OF WILLIAM U. CHANDLER

(NOTE.—Abbreviation: BRC—Breeder Reactor Corporation; CRBRP—Clinch River Breeder Reactor Project; DOE—U.S. Department of Energy; GAO—U.S. General Accounting Office; NERC—North American Electric Reliability Council; SERC—Southeast Electric Reliability Council; and TVA—U.S. Tennessee Valley Authority.)

CLINCH RIVER AND THE SOUTHEAST POWER SURPLUS

Introduction and summary

The Breeder Reactor Corporation and the U.S. Department of Energy propose to finance construction and operation of the Clinch River Breeder Reactor Project in part with sales of electricity and sale of the plant itself. My statement examines the feasibility of this DOE/BRC proposal in the context of surplus electric generating capacity in the Tennessee Valley Authority service area and throughout the southeast region. My statement also examines other basic assumptions made in the BRC and DOE background analyses supporting the alternative financing proposals.

The proposals to fund the CRBRP by selling the power it generates and ultimately the plant itself require forecasting electric power demand. This necessity reminds me of the advice of Alvin M. Weinberg who as my former employer once warned me, "Never make a prediction until you are very old; you might live to see it not come true."

The long lead-time necessary for building power plants, however, requires that we estimate electric power requirements at least a decade in advance. Projections can be made with econometric and engineering energy demand models, and their reliability can be judged by assessing the models' assumptions and methodologies. The Tennessee Valley Authority, for example, projects electric power demand in its service area through the year 2000 with one of the most sophisticated sets of models used in the utility industry. Thus, the saleability of CRBRP power in the TVA region can be viewed in the light of TVA's demand projections. Similarly, the saleability of CRBRP electricity can be considered using studies of future power demand in the entire southeast region.

Footnotes at end of article

A review of future power demand in the TVA region and for the entire southeast leads to two basic conclusions:

1. There is close to a 90 percent probability that TVA will not need Clinch River power through the end of the century.

2. It is highly improbable that the Southeast region will need Clinch River power through the end of the century.

The likelihood that there will be no market for Clinch River power is so great that it undermines a fundamental requirement set by the DOE/BRC drafters of alternative financing plans: "to establish a stable and predictable financial basis for cost-effective completion of the plant."[1] DOE and BRC concluded that CRBRP power would be saleable largely on the basis of a survey of future power demand that is inappropriate for power demand planning.

Furthermore, basic assumptions made by BRC/DOE in their background analyses, including the future price of electricity in the southeast, are at best inconsistent with published DOE estimates and at worst invalid.

TVA obligations regarding CRBRP power

The Tennessee Valley Authority is obligated by contract to purchase CRBRP power, if any is generated, for the first five years of its operation. TVA would pay the BRC for this power at a rate equal to TVA's avoided generating costs. This rate, presumably, would equal the cost of fuel and operation and maintenance expenses for power generation facilities replaced, and would neither cost nor save TVA customers any money. TVA ratepayers should and would not bear any of the initial capital cost of the CRBRP. The CRBR would be a demonstration plant and by definition would be an unreliable source of power, at least though the intitial five-year demonstration phase. TVA, in any case, will have excess generating capacity through this period (1991-1995), and could not justify the purchase of additional generating facilities. Thus, it would be unfair to charge TVA consumers for any unproven facility even if additional capacity were needed.

The Department of Energy, however, proposes that the CRBRP be sold to raise funds after five years of plant operation. The price of the plant would be determined by estimating the present value of future revenue streams from sales of electric power. TVA is obligated to determine this value and would have first right of refusal. The question then becomes, "Will TVA need to buy capacity equal to the CRBRP in 1996, and, if not, can the power be sold in the surrounding region?"

TVA power demand in 1995

"Will TVA need new generating capacity in 1995?" If the probable answer is "No", then BRC faces a much less stable and predictable financial future.

The probability of TVA needing any new capacity, according to TVA's demand forecasts, is very small. Table 1 reproduces TVA's most recent demand forecast,[2] including High, Medium, and Low peak electric demand scenarios. TVA estimates that there is a 90 percent probability that actual demand in 1995 will be lower than forecast by the high scenario.[3] TVA's forecast means that it is highly unlikely that peak power demand in the TVA system will exceed 34,700 megawatts (peak demand plus a 20 percent reserve margin) in the year that sale of Clinch River would be negotiated.

TABLE 1.—TENNESSEE VALLEY AUTHORITY GENERATING CAPACITY VERSUS PROJECTED PEAK DEMAND

[Megawatts]

	Firm capacity	Projected demand (includes 20 percent reserve margin)		
		High	Medium	Low
Year				
1983	37,000	24,800	24,800	24,800
1990	37,000	30,500	27,900	25,100
1995	37,000	34,700	28,400	25,600
2000	[1] 37,000	39,300	33,000	26,600

[1] This figure assumes that TVA does not complete deferred capacity totaling 5,324 megawatts. See table 2.

Source: Derived from "Load Forecast Summary Prepared for Fiscal Year 1983," Tennessee Valley Authority, p. 5, and the TVA Information Office.

TVA currently owns approximately 32,000 megawatts of installed electric generating capacity. By 1988, TVA will have completed an additional 5,000 megawatts now under construction, for a total of 37,000 megawatts of power generation capacity. But peak electric demand will be far lower. TVA, in fact, estimates that there is only a 10 per cent chance that demand will exceed 34,700 megawatts in 1995. Thus, TVA will probably have 2300 megawatts of excess capacity in 1995, the year in which the Breeder Reactor Corporation and the Department of Energy propose to sell the CRBRP. There is very little chance that TVA would want to buy the breeder.[4]

Under a more probable TVA demand projection (the "Medium" scenario) TVA will have an excess of 8600 megawatts in 1995, and 4000 megawatts in the year 2000.[5] Even in the highest demand scenario, the Authority would need no new capacity until 1998.

Even if TVA did require new capacity, TVA would be obligated to complete deferred facilities. TVA has deferred completion of 5324 megawatts, plants on which TVA has already spent approximately $2.5 billion.[6] TVA has recently cancelled approximately 5150 megawatts at a loss of $1.85 billion, an amount which TVA ratepayers will be paying for many years.[7] To incur such a loss, TVA must feel confident that it will not need additional capacity. (See Table 2.)

TABLE 2.—TVA DEFERRED AND CANCELED GENERATING CAPACITY

Category	Megawatts	Cost
Capacity canceled	5,150	$1.8 billion (loss)
Capacity deferred	5,324	$2.5 billion (to date)

Source: TVA Nuclear Cancellation Background Paper, TVA Information Office; U.S. General Accounting Office, "TVA Is Justified In Deferring The Yellow Creek Unit 1 Nuclear Powerplant", and "Tennessee Valley Authority Budget Program for the Fiscal Year Ending September 30, 1983," February 1982, p. 111.

TVA demand forecasts, since the late 1970's, have been expertly prepared. One major uncertainty makes them less reliable, however. The level of power demand for federal uranium enrichment could reduce the aforementioned TVA capacity requirements by 1,925 megawatts.[8] According to TVA:

"Long-term electricity requirements for DOE uranium enrichment on the TVA system are characterized by extreme uncertainty."[9]

TVA attributes this uncertainty to decreased enrichment requirements and the likelihood that the Department of Energy would curtail power purchases from TVA before its other, less expensive suppliers (namely, Electric Energy, Inc., and Ohio Valley Electric Cooperative), and earlier adoption of Advanced Isotopic Separation technology.[10]

In this context, it would at best be risky for the BRC to plan to sell the CRBRP to TVA.

Demand for power in the Southeast

The saleability of CRBR power elsewhere in the southeast region will depend on four factors: regional growth in the demand for power, completion of planned generating facilities, the cost of new sources of power and the ability of any new CRBR consortium to wheel power out of the TVA service area.

The Department of Energy study of alternative financial mechanisms for the CRBR implies that new capacity totaling 16,000 megawatts will be required in the Southeast Electric Reliability Council (SERC) region by 1995.

"The area is projected to require 16,000 MWe of additional capacity to serve peak demand periods by 1995. The CRBRP output would displace only about 2 percent of the projected new demand in 1995."[11]

This projection appears to have been based on a report prepared by the North American Electric Reliability Councils,[12] a report which is inadequate in several respects. First, the report is not a study, per se. The authors did not study and project southeast region electric demand; they simply compiled estimates of demand made by the electric utilities, and the quality of the forecasts made by the utilities varies greatly. Utility forecasts may be sophisticated projections such as those made by TVA, or they may be mere trend extrapolations. Any compilation of utility scenarios, therefore, will be of dubious value.

The unreliability of the NERC study is illustrated by its treatment of TVA demand. NERC projects 1991 power demand in the TVA system by using only the TVA "High" demand scenario. TVA, you recall, described this scenario as having a 90 percent probability of being too high.

A recent study by the Congressional Research Service [13] projects that the southeast region (SERC) will have a reserve electric capacity margin of 35 percent in 1990, and 26 percent in 1995. The latter amounts to 6 percent more capacity than is commonly considered "adequate", and 11 percent more than is considered "acceptable". The projection, moreover, is based on a moderately high rate of economic growth (3 percent annual), and a moderating rate of increase in electric prices (2 percent annual). See Table 3. CRS also assumes greater delays in construction of new facilities than does NRC; that is, if NERC's estimates of new construction are correct, the reserve margin would be even larger than CRS projects.

TABLE 3.—PROJECTED PEAK POWER DEMAND AND CAPABILITY IN THE SOUTHEAST REGION, 1990 AND 1995

	Peak (megawatts)	Capacity (megawatts)	Reserve margin (percent)
Year			
1990	111,000	149,000	35
1995	133,000	167,000	26

Source: Joan Kaufman and Karen E. Nelson, "Do We Really Need All These Electric Plants?" U.S. Congressional Research Service, Report NO. 82-147 S, August 1982, p. 48.

The prospect of low power demand growth in the southeast makes the sale of the CRBRP unlikely. This, in turn, makes a central element of DOE's alternative financing scheme untenable.

Constraints on wheeling CRBRP power

Even if power demand growth made the CRBRP saleable, legal constraints on wheeling power will at a minimum add great uncertainty to any financial proposal involving sale of CRBRP power. Sections 211 and 212 of the Federal Power Act have made wheeling of power almost impossible except where all involved utilities agree to cooperate. If, for example, power had to be wheeled from the TVA system to a utility customer by first utilizing the transmission system of an intermediate utility, the willing consent of the intermediate utility would be essential.[14]

If TVA buys CRBRP and attempts to wheel its power to another system, further difficulties would arise. The TVA Act (Section 15d) prohibits sale of TVA electricity to any utility not already receiving power from TVA in 1959. Some 12 utilities are permitted to receive TVA electricity, however, and could buy and in turn sell TVA electricity to another utility. The cost and complexity of this type of arrangement, however, has precluded such sales in the recent past.[15]

Competitiveness of CRBRP power

The saleability of Clinch River power would be reduced by the unreliability and high cost inherent in any demonstration plant. The Department of Energy suggests, however, that CRBRP power could be competitive:

"To build a single coal-fired 350 MWe plant (comparable to the CRBRP output) utilities are projected to spend $584 million (1984 dollars) for a plant going on line in 1991.

"An analysis of the cost of baseload electricity using coal as fuel was performed for the period during which CRBRP will operate. Analyses covered a range of cost projections between 14.6¢ and 15.7¢ per KWH in 1991 in year of expenditure dollars."[16]

These estimates may be misleading. The lower kWh cost cited above is 50 percent higher than DOE published cost estimates for coal-fired power coming on-line in the southeast in the 1990's.[17] The capital cost cited is approximately forty percent higher than published DOE estimates, reflecting, perhaps, an unrealistic assumption that a utility would build a small (350 megawatt) coal-fired plant rather than capture the economies of scale of a larger (600 megawatt) facility.

Conclusion

Revenue projections made by the Department of Energy and the Breeder Reactor Corporation on the basis of sale of electricity and/or the CRBRP after the initial five year demonstration phase of the plant are extremely tenuous. Revenue estimates have been based on levels of electric capacity demand in the southeast that are improbable, and on electric price levels that are inconsistent with published DOE estimates. The DOE/BRC analyses, therefore, fail to meet their own basic criterion, to establish a stable and predictable financial basis for cost-effective completion of Clinch River. A shortfall in CRBRP revenues would be likely if the plant were built, and these would have to be made up by federal appropriations.

FOOTNOTES

[1] U.S. Department of Energy, Assistant Secretary for Nuclear Energy, Office of Breeder Reactor Programs, "Report To The Congress On Alternative Financing Of The Clinch River Breeder Reactor Plant Project", March 1983, Washington, D.C., p. iii.

[2] Tennessee Valley Authority Office of Power, "Load Forecast Summary Prepared for Fiscal Year 1983", Chattanooga, Tennessee, September 1982.

[3] The TVA forecast reference actually gives demand in megawatts for the years 1990 and 2000. The forecast also provides estimated growth rates for interim years. These rates are used in the following common compound growth formula to derive the 1995 estimates.

$$a_t = a_b e^{rt}$$

where

a_t = megawatt total in forecast year
a_b = megawatt total in base year
e = 2.7182818
r = rate of growth as forecast by TVA
t = time, in years, between base year and forecast year.

[4] Capacity additions were derived from "TVA Is Justified In Deferring The Yellow Creek Unit 1 Nuclear Powerplant", U.S. General Accounting Office, GAO/EMD-82-114, July 30, 1982, p. 24.

[5] TVA "Load Forecast Summary Prepared For Fiscal Year 1983, *Op cit*, p. 81.

[6] Tennessee Valley Authority, "Nuclear Cancellation Background Paper", unpublished TVA paper on file at the Environmental Policy Institute, dated July 13, 1982, p. 3.

[7] See Reference 3.

[8] TVA "Load Forecast Summary Prepared for Fiscal Year 1983", p. 28.

[9] Ibid, p. 26.

[10] *Ibid*, p. 28.

[11] See Reference 1, p. 10.

[12] North American Electric Reliability Council, "Electric Power Supply and Demand, 1982-1991", August 1982.

[13] Alvin Kaufman and Karen K. Nelson, "Do We Really Need All Those Electric Plants?", Congressional Research Service, Report No. 82-147 S, August 1982.

[14] For a discussion of this situation, see "FERC As A Least-Cost Electric Regulator", Hearing before the Subcommittee On Energy Conservation and Power, Committee On Energy and Commerce, U.S. House of Representatives, Second Session, April 23, 1982, Serial No. 97-152, pps. 139-143.

[15] U.S. General Accounting Office, Letter to The Honorables Robert Walker and John Heinz, "Analysis of the Feasibility of Tennessee Valley Authority Power Being Made Available Through Power Exchange Arrangements to General Public Utilities" (GAO/EMD-82-120), September 30, 1982.

[16] U.S. Department of Energy, *op cit*, p. 10.

[17] U.S. Department of Energy, "Protected Costs of Electricity from Nuclear and Coal-Fired Power Plants", Volume 1, Table S1, p. xi, August 1982. The DOE projection is presented in 1980 dollars for a coal fired power plant with scrubbers coming online in the Southeast region in 1995. The figure cited in this testimony is compared with the DOE "Alternative Financing . . ." report figure by inflating the former to 1991 dollars (the same as the latter) at a 7 percent annual rate (the rate suggested in the former DOE report). ●

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Senate

CLINCH RIVER—NOW GAO CRITIQUES COST SHARING

● Mr. HUMPHREY. Mr. President, as I noted in my RECORD entry of April 26, the backers of Clinch River breeder reactor are now arguing that private investors might offset Federal appropriations on the basis of the revenues the plant might produce from electricity sales. As I noted then, this is a mistaken notion since there does not appear to be any willing buyer for either the reactor or its electricity.

Now the General Accounting Office (GAO) has come out with a report on DOE's alternative financing proposals of March 15, which makes it clear that such cost-sharing will actually increase the Federal Government's liability for the project. As the report notes:

> . . . as long as the Government can raise funds by selling Treasury securities at a rate less than the rate of return which is anticipated for the CRBR private sector funds, it would cost the Government more—in interest payments—to build the CRBR with funds from private investors. The Government will incur this increased cost whether the project succeeds or fails.

But the likelihood that the project will operate as well as DOE hopes it will is open to serious question. It is also doubtful that the project will produce as much revenue as DOE optimistically projects. Under these circumstances, DOE's proposals to guarantee that the investors will get all of their money back plus interest would end up costing the taxpayers even more. As the GAO notes, with these guarantees—ones that the project's backers claim are essential to secure private investors—"the Federal Government, still retains most risks [sic] if the project fails, or if cost overruns occur."

All of this should lead us to the conclusion that the proper test for whether or not Congress should back the project is whether or not it has the stomach to pay for it outright. I believe the House all gave us some instruction on this issue last December. It's time we followed the House's lead.

Mr. President, because the funding of Clinch River and alternative financing for the project will be major issues in the Senate's consideration of the energy and water development appropriations bill for fiscal year 1984, I ask that the entire text of the GAO's report be printed in the RECORD.

The text of the report follows:

U.S. GENERAL ACCOUNTING OFFICE,
Washington, D.C., May 11, 1983.

B-104105.
Subject: Analysis of Studies on Alternative Financing for the Clinch River Breeder Reactor (GAO/RCED-83-151)
Hon. GORDON J. HUMPHREY,
U.S. Senate.

DEAR SENATOR HUMPHREY: The Conference Committee Report for the Further Continuing Appropriations Act for Fiscal Year 1983 (Public Law 97-377, Dec. 20, 1982) directed the Department of Energy (DOE) to report to the Congress by March 15, 1983, on options for securing additional private sector financing for the Clinch River Breeder Reactor (CRBR) project. When CRBR was first authorized in 1970 it was estimated to cost $700 million with private sponsors and the Government assuming nearly equal shares of the project's cost. However, the private contribution was fixed while the Government was responsible for cost increases. In the intervening years project costs have increased to an estimated $4 billion [1] of which the Government's share is about $3.7 billion. Against this backdrop, the Conference Committee requested DOE to report on additional private financing.

Between February 18 and March 2, 1983, you and three other Members of Congress [2] asked us to review the anticipated DOE report and provide our assessment on the alternatives presented by DOE for securing additional private financing.

DOE issued its "Report to the Congress on Alternative Financing of the Clinch river Breeder Reactor Plant Project" on March 15, 1983. In the report DOE said that its approach was to develop Government technical input which a utility task force, organized by the Breeder Reactor Corporation [3] in January 1983, could use to develop private financing. Reflecting this approach, the DOE report presented

A history of the CRBR

Information on project costs, reliability, and projected revenue, and

A synopsis of a possible private financing alternative developed for DOE by the corporation task force.

The DOE report presented the corporation's alternative, but DOE's report did not present any other alternatives.

The corporation's alternative is only a preliminary one. The Chairman of the Breeder Reactor Corporation presented the task force's alternative in a March 12, 1983, report to the Secretary of Energy. This report also described in general terms other funding alternatives for CRBR from the private sector perspective. In transmitting the report to DOE, the corporation chairman cautioned that the report was preliminary, had not been reviewed by the corporation's board of directors and the task force was continuing its work developing more specifics on its alternative.

The task force concluded that CRBR should be able to attract a large amount of private funding—up to an additional $800 million—because it, would (1) generate revenue from electricity sales and (2) provide additional income from Federal tax incentives which private investors should find attractive. However, the corporation report points out that the viability of private sector investment will be contingent on enactment of a number of Government assurances and guarantees related to funding, completing, licensing, and operating the CRBR plant. The report points out that the assurances and guarantees are required because CRBR presents unique risks to private investors.

Thus DOE's and the corporation's reports represent only the beginning of a process that will require much more work before a detailed private financing proposal is developed. DOE's report recognizes that developing the specific structure and arrangements of a private investment venture will require extensive discussions with potential customers of CRBR-generated power and negotiations with potential investors. DOE stated that such discussions and negotiations were not possible in the time available to prepare its and the corporation's reports. Without such discussions, DOE said that it could not predict the potential interest of possible investors in the project. DOE recognized that decisions by potential investors depend on developing a more specific proposal and on the final form of legislative authority that DOE seeks to enable it to provide the desired assurances and guarantees. DOE is relying on the corporation to pursue discussions with potential investors aimed at developing specific investment and marketing strategies. A date for completing a private investment proposal has not been established. However, DOE officials said that they hoped a specific proposal can be developed in time to provide private funding in early 1984.

Because DOE and the corporation have not yet developed and presented specific information, a detailed analysis or conclusion regarding the feasibility and/or merits of increased private sector investment in the CRBR project is not possible. However, certain of the underlying concepts contained in the framwork for securing alternative financing have been sufficiently described for us to offer the general comments and observations contained in this report. It should be noted that other variations of private CRBR financing—both within and outside the framework presented—are possible, and could affect our comments and observations.

Before presenting our comments and observations on the financing proposals, one basic point must be made. Over the last several years, we have consistently pointed out in reports and testimony to the congress that CRBR is a research and development project on the road to demonstrating the potential for applying breeder technology in the United States. Therefore, we continue to believe that the main element in considereing funding decisions must be the project's research and development importance.

With this overall point in mind, we have two specific observations on the private financing proposal presented in the corporation task force report. First, while the proposal will probably change many of the existing project arrangements, the Federal Government still appears to retain most risks if the project fails or if cost overruns occur. Second, while the additional private sector financing discussed in DOE's and the corporation's reports would produce budgetary savings during the CRBR's construction, such savings would be a trade-off against either future reductions in Federal revenues or additional budget outlays. Specifically, the revenues expected to be produced from the sale of CRBR-generated electricity will be used to pay back private investors. If, however, the revenue is inadequate, private investors would have to be repaid from DOE appropriations.

The remainder of this report discusses (1) our objectives, scope, and methodology, (2) why private sector financing is being sought for CRBR, and (3) certain issues raised by changing the existing CRBR arrangements and their impact on the Federal Government.

OBJECTIVES, SCOPE, AND METHODOLOGY

At the request of the Chairmen, Subcommittee on Energy Conservation and Power and Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, Senator Gordon J. Humphrey, and Representative Marilyn Lloyd, this report discusses Federal impacts of the private funding proposal presented in DOE's and the Breeder Reactor Corporation's reports. While some of the requestors asked for reports on other areas, these areas will be covered in subsequent reports.

Neither DOE's nor the Breeder Reactor Corporation's report proposed a specific method for obtaining private sector investment. We did, however, review the financial mechanisms and the assumptions, guarantees, and assurances which are discussed in the respective reports. Our review was conducted from the perspective of how private sector funding and the associated tax benefits would affect the net Federal cost of the

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[1] Footnotes at end of article.

CRBR and how the reports' assumptions, guarantees, and assurances would affect the risk and responsibilities assumed by the Federal Government. Our review was also conducted under the assumption that CRBR would be built.

We discussed the contents of the reports with DOE and Breeder Reactor Corporation task force officials who were responsible for major report segments. When appropriate, we discussed the reports and documents with those officials who prepared information used in the reports and with utilities which may be asked to purchase CRBR generated electricity or invest in the CRBR project.

We also reviewed a March 18, 1983, internal DOE study which detailed a possible financing arrangement. This study was not intended to be a part of DOE's report to the Congress nor was it intended to be an actual draft proposal. However, because the assumptions and financing configuration were within the parameters of DOE's and the corporation's reports, the study was a useful example of a possible proposal. We discussed this study with the DOE officials who prepared it and with the officials who prepared DOE's report to the Congress.

The review was performed in accordance with generally accepted government auditing standards.

PRIVATE SECTOR FINANCING FOR CRBR SOUGHT BECAUSE OF INCREASED FEDERAL COSTS

When the CRBR—designed to be the Nation's first liquid metal fast breeder reactor[4] demonstration plant—was initially authorized by the Congress in 1970, it was estimated to cost around $700 million. In 1974, after completion of detailed design work, Government and industry participants estimated that the CRBR would cost $1.7 billion to construct.[5] A number of utility companies had pledged $256 million to the Breeder Reactor Corporation to be used to construct the CRBR (that sum, plus interest, is currently estimated to total about $352 million). The remainder was to be funded by the Federal Government.

DOE currently estimates CRBR will cost $4 billion. Much of the cost increase can be attributed to project delays and changes in program emphasis. We have issued reports on the program's direction[6] and its current cost estimate.[7] In those reports we commented that the Congress has several basic options available for deciding the future of breeder reactors in the United States and on the uncertainty of CRBR cost estimates.

Although CRBR's estimated construction cost has increased substantially, the utilities' contribution has remained relatively constant (increasing only due to interest earned on contributions). The resulting increase in the Federal Government's share has been the subject of congressional concern during its recent debates over continued funding for CRBR. Accordingly, the Congress directed DOE to study alternative methods to finance the remaining $2.3 billion required to complete the CRBR (about $1.7 billion of the total $4 billion has already been funded). Reflecting the intensity of the congressional concern is the Secretary of Energy's statement in early 1983 that unless private sector funding was secured, he doubted that the Congress would continue to fund CRBR.

DOE's March 15, 1983, report provided a framework for developing financing alternatives but did not contain a specific, detailed proposal for obtaining private funding. Instead, DOE indicated that the report was to provide technical input "concurrent with and for use in the development of financial alternatives by the private sector Utility Task Force organized under the auspices of the Breeder Reactor Corporation." As a result, DOE's report contains background information on CRBR and present projections for CRBR's operating costs, electricity production, and the anticipated revenues. DOE's report also synopsizes the private financing alternative presented in the corporation's report.

The Breeder Reactor Corporation report was prepared to provide information on alternative financing possibilities for CRBR. Its report estimated that up to an additional $800 million in private investment could be provided to construct CRBR. It also states that based on estimated CRBR revenues and tax benefits to the investors, significant private sector investment should be available if the Federal Government guarantees and assurances include:

Federal assurances that CRBR will be completed, licensed, and operated. Such assurances must be unconditional if private investment is to obtained. In the event CRBR is not completed, licensed, and operated, private investors must be able to recover their investment plus a return on the investment.

Federal assurance that CRBR will produce the estimated revenues. The Federal Government must guarantee the amount of power CRBR will produce and that the power will be purchased at an assured price.

Federal commitment that adequate Federal funds will be appropriated after fiscal year 1983 to enable current construction schedules to be met and a commitment that funding will continue until the project achieves a commercial level of reliability.

Federal assurance that CRBR-related tax incentives will be available to private investors. The tax incentives include investment tax credits and accelerated depreciation. Further, the report suggested that if they were not adequate, the Congress might wish to consider other tax credits, tax deductions, and exemption of investment income.

To take full advantage of the Government's guarantees and the tax benefits, the corporation report concluded that the private investment should be a combination of direct borrowing, repayable equity partnership, and debt securities.

The corporation's report provides few details. For instance, specific rates of return, payback methods, and timing were not discussed. Although the corporation's report was synopsized in DOE's report to the Congress, the Deputy Assistant Secretary for Breeder Programs told us that DOE's report would not recommend a specific proposal because it will be up to the Congress to select a proposal.

PRIVATE FINANCING WOULD CHANGE EXISTING CRBR ARRANGEMENTS

Under present arrangements, DOE is responsible for (1) managing the CRBR project, (2) supplying all but about $350 million (mainly the utilities' contribution) toward the cost of designing and constructing the CRBR, and (3) funding all cost overruns. In addition, although the Tennessee Valley Authority (TVA) is responsible for operating the CRBR during its first 5 years of operation, DOE will pay all operating costs and will receive all revenues from the sale of CRBR produced electricity. Information obtained from operating the CRBR, as well as patent and licensing rights, belong to the Federal Government and to the contributing and noncontributing utilities.

DOE's and the Breeder Reactor Corporation's reports predict that in order to attract additional private sector investment, many of the existing arrangements will need to be changed. For example, (1) the private investors will take over partial ownership of CRBR from DOE, (2) TVA would have to give up its option to purchase CRBR after its first 5 years of operation, and (3) TVA will have to give up its right to purchase CRBR power at its marginal power cost. If the private financing proposal includes the types of guarantees outlined in the DOE and corporation's reports, the Federal Government, still retains most risks if the project fails, or if cost overruns occur.

POTENTIAL IMPACT OF PRIVATE FINANCING

DOE's and the Breeder Reactor Corporation's reports state that private sector investment could provide an alternative financing source for the funds needed to construct the CRBR. The reports estimate that private financing could replace from $385 million to $800 million (depending on the timing of the investment) that would alternatively have to be provided by the Federal Government. Such private investment would offer the distinct short-term advantage of reducing the need for appropriated funds to complete construction of the CRBR.

Although private funding for CRBR will reduce the amount of Federal appropriations required for construction, it could increase the Government's overall cost. The added cost could accrue if the Government has to repay the investment at a rate of return higher than the Government's cost of borrowing, a likely possibility. The tax benefits available to private investors will, in effect, enhance the investors rate of return by reducing their Federal taxes.

Private investors generally need a higher return than Government must pay for funds

Although no specific proposals have been presented, apparently the corporation report views private investment as a mixture of debt (loans and/or bonds) and equity (partnership) financing. Our discussions with corporation representatives indicate that a private equity investment would have to be repaid—both principal and interest—just as the loans and/or bonds are repaid. For that reason, the discussion of private investment repayment pertains to both the debt and equity portions of the funding. DOE officials projected that a rate of return in the range of 10 to 20 percent would be required to attract private funding. The Breeder Reactor Corporation expects debt financing to carry a rate of return of about 10 percent while the equity financing is expected to carry a rate of return—including tax benefits—of about 20 percent.

According to the Breeder Reactor Corporation's report, if private investment for CRBR is obtained, all such investment—including both equity and debt investment—must be repaid either from CRBR revenues or by the Federal Government, which would provide guarantees to project investors if the CRBR fails to provide the estimated revenues. Because the Federal Government is expected to guarantee that the investors will be repaid either from project revenues the Government is giving up, or from appropriations, the private investment can be viewed as a loan to the Government. Similarly, the direct Federal financing option can also be viewed as a borrowing arrangement because the Government raises much of its money through direct borrowing in the capital market.

Thus, the value of private versus direct Federal financing can be determined by comparing the Government's borrowing cost under each alternative. In the private funding alternative the Government must pay the investor a rate of return which the corporation report estimates to be over 10 percent. In direct Federal borrowing the Government's interest rate is determined by the rate it pays on Treasury securities, which is currently under 10 percent. As illustrated, as long as the Government can raise funds by selling Treasury securities at a rate less than the rate of return which is anticipated for the CRBR private sector funds, it would cost the Government more—in interest payments—to build the CRBR with funds from private investors. The Government will incur this increased cost whether the project succeeds or fails. If the project succeeds, the higher interest cost will be paid from the project revenue. However, because of the difference in interest rates, the same amount of revenue could offset higher levels of Government borrowing. If the project fails or does not provide adequate revenues to repay investors, the Government will pay the cost with appropriations. Hence, obtaining private sector financing for the CRBR, of the type conceptually described by DOE and the Breeder Reactor Corporation, appears to offer no cost advantage over the current CRBR financing arrangement.

Need to consider tax consequences of obtaining private financing

The Breeder Reactor Corporation report stated that the tax benefits which may be associated with CRBR would help make it a more attractive investment to the private sector. The report cites investment tax credits and accelerated depreciation as the primary forms of tax incentives for private investors. Further, the report suggested that if these tax incentives were not adequate, the Congress may want to consider energy tax credits, research and development tax deductions, and exemption of investment income. While CRBR's tax benefits may attract private investors by raising the effective rate of return, it is important to note that they will result in reduced Federal tax revenues. However, this lost revenue must be balanced against increased revenues that the Government would receive by taxing income private investors would earn from investing in CRBR. Whether these increased future tax revenues would offset the short term reduction in Federal tax revenues is a question we cannot answer because the corporation's report does not provide the necessary specific information.

Investment tax credits could be an important incentive in attracting private investors. Generally, the investment tax credit allows a reduction in the investors' tax liability amounting to 8 percent of their investment. Although the size of private equity investment is not now known, the credit on an $800 million investment could reduce investor's tax liability by a total of as much as $64 million (in year of expenditure dollars from 1984 through 1989).

The incentives resulting from accelerated depreciation provide another area in which the proposed private investment could affect Federal tax revenues. Using a financing example contained in a March 18, 1983, DOE study,[8] tax savings resulting from accelerating depreciation on a $763 million investment would reduce the investor's tax liability by about $351 million (assuming a Federal tax rate of 46 percent). Because the reduced tax liability is a loss to the Treasury, the Government could be giving up $351 million in future tax revenue—due to depreciation alone—to obtain an increased private investment of $763 million during 1984, 1985, and 1986.

The corporation report mentioned that additional tax credits could be made available to investors through energy tax credits.[9] The Energy Tax Act of 1978 (Public Law 95-618, Nov. 9, 1978) and the Crude Oil Windfall Profit Tax Act of 1980 (Public Law 96-223, Apr. 2, 1980) provided the Business Energy Investment Credit as one of several tax incentives to encourage the conversion from oil and gas to new energy systems. The credit applies to solar and wind energy systems and would have to be extended to apply to CRBR. Furthermore, the authority for the credit is scheduled to expire in 1985. If the act were amended to cover the CRBR and extended past 1985, investors could obtain a tax credit equal to 15 percent of their investment. This is in addition to the 8-percent investment tax credit available to CRBR investors and any other business investing in new machinery or equipment.

The corporation's report suggested that research and development tax deductions would also be an attractive incentive to private investors. That deduction would be equivalent to the difference between the cost of CRBR—about $4 billion—and the plant's market value. The market value is derived from expected sales revenue and tax savings to investors. The corporation task force estimates the market value to be about $1.1 billion. Therefore, the deduction could be based on about $3 billion. Because this incentive is a tax deduction and not a tax credit the actual impact on the tax liability would depend on the investors' tax rate. According to the corporation report, a favorable tax ruling or specific legislation would be required to make use of this incentive.

The final tax incentive suggested by the Breeder Reactor Corporation involves exempting investment income. If a portion of the private sector investment is obtained through industrial development bond issues, the income from that investment could be exempted from tax if special authorization by the Congress is enacted.

The Breeder Reactor Corporation believes that the tax benefits associated with privately financing CRBR will not decrease Federal tax revenues. The rationale for that belief is that if CRBR is privately financed, investors will not build a similar amount of coal-fired powerplant capacity. Thus, tax benefits taken on CRBR will only displace tax benefits that would otherwise be taken on coal plants.

This reasoning does not appear appropriate. First, private investors' tax benefits are a real cost of the private financing option, whether or not the CRBR displaces a conventional powerplant and, therefore, should be considered. We recognize, however, that although these tax benefits are a short-term loss to the Federal Government they could be offset over the life of the project by taxing investors' future income. Second, one should not necessarily assume that investors would build a similar amount of coal-fired powerplant capacity if CRBR were not built. Given the relatively small contribution CRBR power output (350 megawatt) would make to total generating capacity it is unlikely that the loss of CRBR power would of necessity require investment in coal-fired facilities. This is especially true in light of the overcapacity which currently exists in the utility market.

OTHER MATTERS

The alternative ways that the Congress may finance CRBR and the guarantees that may be required in a private funding alternative raise two basic issues about how the various financing and guarantee impacts can be best identified in the budget process.

The first issue revolves around two options for the timing of appropriations. Under one option called full funding, the Congress would, under any financing alternative, appropriate in DOE's budget the Government's total estimated cost for CRBR construction in the year it commits to construct the project. The main advantage of this approach is that it allows the Congress to have a clear presentation of the project's full cost when it considers whether construction should be started. Recognizing this advantage, we have consistently supported the full funding approach for projects such as CRBR. For example, we have recommended that the General Services Administration fully fund leases[10] and that the Federal Maritime Administration fully fund ship construction.[11] The other option is continued yearly review and appropriation. The main advantage of this approach is that it allows the Congress to evaluate a project's needs and schedule yearly.

The second question is how guarantees, which the Congress may have to honor in later years, should be shown in the budget. In numerous reports and testimony before the Congress we have stated that when the Federal Government makes guarantees which (1) could involve large amounts of money, (2) are directed to only a few entities, and (3) involve a considerable risk of failure, the Congress should provide—in the budget year of commitment—an amount of budget authority—an appropriation—sufficient to cover a significant portion of the guaranteed amount. The main advantage of this approach is that it ensures that the guarantees are given adequate visibility and appropriate attention in the budget process. Because CRBR meets these requirements any Federal guarantees supporting the project should—to some extent—be covered by budget authority.

In summary, this report discuses the salient aspects of the Breeder Reactor Corporation's report for achieving additional private financing for the CRBR. We point out that this alternative would modify certain of the management arrangements for the CRBR and presents a tradeoff of short-term budgetary savings against possible higher overall Government costs for the project. However, we recognize that the efforts to obtain additional private financing are of a preliminary and evolving nature and that changing certain of the key provisions in the financing alternative presented in the Breeder Reactor Corporation report would likely impact its attractiveness to the Government in terms of costs and risks. While the focus of this report is on obtaining additional private financing, we continue to believe that it is important not to lose sight that the main element influencing continued funding decisions is the CRBR's research and development importance.

We did not solicit DOE's review and comments on a draft of this report. We have, however, discussed the report's contents with managers of DOE's CRBR project in an effort to include DOE's views and ensure the report's accuracy.

We are also sending this report today to the Chairmen, Subcommittee on Energy Conservation and Power, and Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce; and Representative Marilyn Lloyd.

We plan no further distribution of this report until 7 days from the date of the report unless its contents are publicly announced by you or one of the other requestors. At that time, we will send copies of the report to the Director, Office of Management and Budget, the Secretary of Energy; and to other interested parties. We will also make copies available to others on request.

Sincerely yours,

J. DEXTER PEACH,
Director.

FOOTNOTES

[1] In 1982 DOE estimated that CRBR would cost $3.6 billion. This figure is obtained by subtracting net revenue during the project's first 5 years of operation from construction cost. The $4 billion figure represents construction cost without subtracting net revenue.

[2] The three other Members of Congress who requested this review are listed on page 4. As agreed, this report will be issued simultaneously to all requestors.

[3] The Breeder Reactor Corporation is a company formed to obtain the financial and other participation of the 753 utilities contributing funds to the project.

[4] A breeder reactor is a nuclear reactor that creates more fuel than it consumes. The term "liquid metal" refers to the liquid sodium which serves as the reactor coolant.

[5] All CRBR costs are shown in current dollars.

[6] "The Liquid Metal Fast Breeder Reactor—Options for Deciding Future Pace and Direction" (GAO/EMD-83-79, July 12, 1982).

[7] "Interim Report on GAO's Review of the Total Cost Estimate for the Clinch River Breeder Reactor Project" (GAO/EMD-82-131, Sept. 23, 1982) and "Analysis of the Department of Energy's Clinch River Breeder Reactor Cost Estimate" (GAO/RCED-83-44, Dec. 10, 1982).

[8] On March 18, 1983, DOE completed a study of a possible investment scenario. The study is not part of the submission to the Congress and is not a proposal. The scenario is, however, within the investment framework described in DOE's and the Breeder Reactor Corporation's reports.

[9] For further information on energy tax credits see our report "The Business Energy Investment Credit for Solar and Wind Energy" (GAO/RCED-83-81, Mar. 7, 1983).

[10] "Costs and Budgetary Impacts of the General Services Administration's Purchase Contract Program" (LCD-80-7, Oct. 17, 1979).

[11] "Further Implementation of Full Funding in the Federal Government" (PAD-78-80, Sept. 7, 1978). ●

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Senate

CLINCH RIVER—THE COAL VOTE IS NO

● Mr. HUMPHREY. Mr. President, for many years the coal lobby in this country has pretty much gone along with what the nuclear power lobby has wanted. Nuclear power, after all, represents only 12 or so percent of the electricity currently generated in the United States. What is the point of fighting over such a relatively small share of the electricity generation market when coal is needed for coking purposes as well?

With the current budget squeeze and the growing cost of the Clinch River Breeder Reactor project in relation to the Department of Energy's coal research and development efforts, though, things have changed. This year's proposed House appropriation for Clinch River, for example, is hardly enough to keep the project on schedule and yet is nearly as much as the proposed House figure for all Federal coal research projects combined.

Given the nearly 40,000 coal miners now unemployed in the United States, this disproportion (and this does not count the additional $300 million or so spent that will be on fundamental breeder research and development programs) has finally become intolerable to those who make their living in the mines. This was made clear last Tuesday, May 10, when Richard L. Trumka, president of the United Mine Workers of America, formally announced his opposition to the project and urged the House to vote to halt funding for all work on the Clinch River project.

Mr. President, Mr. Trumka offered a cogent statement on why America's coal miners no longer can support the Clinch River breeder reactor project. I ask that the entire text of his association's press release covering this statement be entered into the RECORD.

The text follows:

UMWA HITS REACTOR FUNDING

WASHINGTON, May 10.—Richard L. Trumka, president of the United Mine Workers of America, today urged the House of Representatives to vote to halt funding for all work on the controversial Clinch River breeder reactor.

The House Science and Technology Committee voted on April 26 to stop work on the project unless Congress agrees to a private cost-sharing plan by Sept. 30, 1983, an unlikely prospect.

"This risky, multi-billion dollar nuclear project is taking the country down the wrong road, is far too costly in a time of high deficits and would generate unneeded power," Trumka said.

The U.S. General Accounting Office, a congressional watchdog agency, has projected that the project could eventually cost more than $8.5 billion. The proposed demonstration plant near Oak Ridge, Tenn., has already cost $1.5 billion, with taxpayers paying more than 90 percent, and construction has yet to begin.

"In terms of safety and an economic recovery, the construction of a breeder reactor while more than 40,000 U.S. coal miners are without work and electric demand is falling is the wrong signal at the wrong time," Trumka said.

"The Energy Department's own blue-ribbon panel proposed that Clinch River be indefinitely postponed."

"The billions saved by not building the Clinch River project should be invested in advanced coal technologies, black lung programs, pollution control research and other coal development programs—in short, a new national energy policy based on coal," the UMWA president said ●

United States of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, WEDNESDAY, JUNE 8, 1983 No. 80

Senate

CLINCH RIVER: DOE'S FERMI-II?

● Mr. HUMPHREY. Mr. President, one of the key arguments made by proponents of the Clinch River breeder reactor project is that the reactor represents a major breakthrough—the first large-scale breeder to be integrated into an existing commercial electrical grid. Indeed, one of the project's biggest boosters, Alvin Weinberg, has repeatedly emphasized this point.

What these boosters conveniently forget, though, is private industry's own construction and operation of a 175-megawatt breeder near Detroit called Fermi-I in the mid-1960's. This private effort is instructive on four counts. First, unlike Clinch River, all of Fermi-I's costs and risks were assumed by the private sector. Second, and largely as a result of this, the project ended up costing far less—only $25 m'llion, 160 times less—than even the Department of Energy's lowest cost estimate for Clinch River. Third, significant experience was gained from the reactor's operation. Indeed, many of the key design features of Clinch River came directly from the Fermi-I plant. Finally and most important, the Fermi-I effort proved to be terribly premature, and in fact experienced a series of breakdowns including a localized fuel core meltdown that kept the plant off-line for nearly 4 years.

Mr. President, before we consider funding the Clinch River project this year, it is important that we consider the extent to which we may simply be building another Fermi-I but now at exorbitant public expense. Indeed, even members of the utility industry are now arguing this. Thus, in the May 26, 1983, issue of Public Utilities Fortnightly, a journal reader forcefully challenged the wisdom of proceeding with Clinch Rive, given the Fermi experience.

Mr. President, I ask that the full text of this letter and James P. Lagowski's "The Significance of Fermi," the concluding chapter of the American Nuclear Society's history of Fermi-I, be entered into the RECORD.

The material follows:

(From Public Utilities Fortnightly, May 26, 1983)

CLINCH RIVER BREEDER REACTOR PROJECT NOT NEEDED?

This letter is written as a response to the guest editorial of your April 14, 1983, issue: "Why Clinch River?" by Alvin M. Weinberg. I find this editorial misleading and incorrect in its main premise.

My disagreement centers on the author's statement in the fourth paragraph of his editorial: "Clinch River is our first fully integrated large-scale breeder." This is simply not true; the Fermi I project, completed in the mid-1960s, was a fully integrated, 175-megawatt power plant connected to a large electrical system at 115 kilovolts.

This power plant has been the subject of countless articles, and reports, both inside and outside of the industry, including one best selling (and sensationalized) book titled "We Almost Lost Detroit." Fermi I is widely known within the nuclear industry, of which Dr. Weinberg claims forty years experience.

Fermi I was built entirely with private funds by a consortium with 110 corporate participants. But, to sum the project up, it was a brilliant and innovative undertaking that came to an ugly and heartbreaking end. Everything seemed to go wrong, despite the efforts of the dedicated and skilled builders and operators of the plant. After a series of accidents, including a class 9 fuel melting situation (localized to a small part of the core due to coolant blockage), the plant was ordered shut and decommissioned by the Atomic Energy Commission. One of the plant's steam generators is now in Japan being used as part of a nuclear project. This is proof of the fine work done on the plant.

Why should Dr. Weinberg ignore Fermi I and its hard but invaluable lessons? The answer is simple and contained in the title of his editorial: Why Clinch River? Dr. Weinberg argues that we will never know the problems and possibilities of a breeder reactor without an operating example, and this is true. However, a large-scale breeder has been built and operated in this country, and given us plenty of information about breeders—most of it unpleasant. Why should we spend billions and billions of federal tax dollars to learn the same things? Clinch River seems far less justifiable considering the Fermi I experience. Therefore, Fermi I must be ignored.

Fermi I was a bold and daring project, those responsible for it deserve our thanks for their hard labors. To ignore their findings is a shocking insult, to persist in that ignorance invites disaster. The nuclear industry cannot survive if it persists in ignoring the hard lessons of its past.

—BRIAN O'NEIL.

THE SIGNIFICANCE OF FERMI

(By James P. Lagoswski[1])

[From E. Pauline Alexanderson, "Fermi-I," (La Grange Park, Ill.: The American Nuclear Society, 1979). "The Fermi reactor has accomplished its primary research and training goals. As a proven operating fast breeder reactor, all of its components functioned as a system under complete control, and it has shown that a reactor of this type can take its place with conventional units within a large electric power system. The world's largest operable breeder, it has established a basis for future breeder reactor technology."—Walker L. Cisler[2]]

The Fermi Project will be remembered as one of the first major U.S. efforts to commercially harness the vast potential energy resources in uranium. From 1963 to 1966, and from 1970 to 1972, Fermi was the largest operating fast breeder reactor in the world.

The contributions of this project to fast reactor technology range from design and development activities, prediction of nuclear characteristics, plant test experience, and maintenance of large sodium systems and components, to such achievements as the establishment of legal precedents and worldwide personnel training.

DESIGN AND DEVELOPMENT

During the first several years of the project, many studies were undertaken to establish a basis for the plant design. There was no prior experience in the design of large liquid-metal fast breeder reactor (LMFBR) power plants at that time, although the 1-megawatt (thermal) [MW(th)] Experimental Breeder Reactor-I (EBR-I) did exist and the 62-MW(th) EBR-II design was progressing in parallel.

The basis for many fundamental design decisions had to be established. This included such items as a choice between sodium and sodium-potassium coolant, provision for decay heat removal (including a decision between upflow and downflow), the need for auxilary power and auxiliary pumping capacity to ensure shutdown heat removal capability until natural circulation was established, and evaluation of tank type versus piped primary coolant systems. Equally important decisions had to be made in such areas as hot-leg versus cold-leg primary pump arrangment, plant operating conditions, materials selection, plant component and system design criteria, provisions for sodium purity monitoring and cleanup, plant and equipment layout for maintenance accessibility, in-vessel and ex-vessel fuel handling, the choice of nuclear reaction control materials, plant instrumentation and control systems, and innumerable other decisions.

Concurrent with the design effort, very significant research, development and testing activities were carried out in sodium technology. These activities included steam generator model testing, sodium-water reaction rates, sodium fires, sodium chemistry, fuel subassembly and core component development, fast reactor safety including fuel melting experiments, theoretical methods development for accident analysis, Doppler theory, and sodium reactivity effects. Other areas included reactor stability including theoretical methods and experimental techniques, fast reactor physics including methods development, critical experiment planning and analysis, models for core power feedback effects, and radiation shielding.

This design and development program, combined with a carefully developed philosophy of safety, resulted in a safeguards envelope that could protect against accidents far in excess of those deemed credible. Gross core meltdown was essentially precluded by piping design, double containment of the primary coolant, reserve sodium supply, auxiliary coolant pumps, and backup diesel generator and battery electric supply, as well as limitations on sources of positive reactivity. Nevertheless, the containment building was designed to withstand the effects of an energy release (including expulsion of the 147-ton shield plug that closed the top of the reactor vessel) which could result if it were arbitrarily assumed that the entire core melted, with the top half of the core collapsing into the other half. The result of these efforts was the Fermi Plant design, as constructed. The design experience and development work were fully documented (see Appendix D) and made widely available; this made a substantial contribution to LMFBR technology. Table I describes the magnitude of the reporting effort. Many of the features of subsequent U.S. and foreign LMFBRs trace their origin to the Fermi experience described in these reports.

At the time the Fermi Plant was designed, many decisions had to be made based on very little prior experience. Fermi experience proved that most of those early decisions led to satisfactory design approaches and provided a solid basis for design decisions on future plants. In 1970, Atomic Power Development Associates (APDA) and its Japanese personnel[3] developed a concept for a 350-MW(e) fast breeder reactor based on an extension of the Fermi experience. This conceptual design was used as one of the starting points in designing Japan's demonstration plant, MONJU. the USSR BN-350 is another example in which Fermi precedence and experience were utilized. The U.S. Fast Flux Test Facility (FFTF), now under construction, and design of the U.S. demonstration plant at Clinch River use many features of the Fermi design. The value of being able to build on the successful features of the Fermi Plant is incalculable.

PREDICTION OF NUCLEAR CHARACTERISTICS

In the early days of the Fermi Project, there was some apprehension over the potential safe operating characteristics of the fast reactor. This concern was largely due to the lack of experience at that time, but was partially related to the EBR-I meltdown of 1955, the possibility of a positive Doppler coefficient, and the general sensitivity of fast reactors to core material displacement due to thermal/mechanical interactions (because in melting, the metal fuel could become more reactive through compaction).

Important basic development work in fast reactor safety was accomplished in the course of developing the Fermi design. The successful culmination of this effort is best evidenced by the results of the detailed nuclear testing of the plant. Nuclear and plant tests were carried out at various power levels up to the 100 MW(th) licensed power. These tests, described in earlier chapters, generally confirmed the nuclear and thermal-hydraulic design predictions. Many significant details learned in this experience were factored into subsequent U.S. and foreign LMFBR plant designs.

This thoroughly documented testing (see Appendix D) proved that a properly designed fast reactor plant does indeed function in a safe and predictable manner. The plant operated in a very stable manner and was easily controlled. Nuclear characteristics such as power coefficients, power distribution, control rod worths, core geometry reproducibility, neutron shielding, sodium reactivity, power coefficient linearity, burnup reactivity effects, and many other features were found to be essentially as predicted.

OPERATING EXPERIENCE

The Fermi Plant operated for many years with the primary and secondary systems filled with sodium. There were about 300 days of total nuclear operation and about 100 days of operation at significant power. This included several successful runs at the licensed power of 200 MW(th). High-power operation was limited only because of the steam generators and Core A fuel behavior.

In the period prior to the October 5, 1966 fuel melting incident, power operation was principally limited by the availability of steam generators. During that period, the plant experienced many instances of leaks in the tube-to-tubesheet welds. These leaks were extremely small, but large enough to require shutdown of the units for repair. The plant maintenance staff became very proficient in removing the steam generators from service, locating leaks, plugging tubes, and returning the units to service.

In the period when the reactor was shut down following 1966 fuel melting incident, a major revision of the tube-to-tubesheet joints was made on all three steam generators by The Detroit Edison Company and the maufacturer, using an internal bore weld. In subsequent operation, this repair appeared to have been very successful. The units were tighter than ever before. Low hydrogen levels in the argon cover gas were a good indication of a tight system. However, some additional leaks were experienced in steam generator No. 1.

The steam generator experience was particularly relevent in view of the fact that the sodium steam generator is widely recognized as one of the major development problems in LMFBR technology, and the fact that the Fermi units, which were once-through, single-walled tube units, were designed as a prototype for commercial operation.

During decommissioning, The Central Research Institute of Electric Power Industry (CRIEPI) of Japan purchased the No. 1 steam generator from The Detroit Edison Company for one dollar and shipped it to Japan, where an extensive metallurgical examination of this unit was performed. Results of this examination revealed that all the tube leaks and all the corrosion were taking place at the low points of the tube routings and on the bottom half of the tubes. These facts led to the conclusion that the cause of the leaks was attributable to the fact that water used to locate tube-to-tubesheet failures was not completely removed following execution of the leak-test procedure. It was also concluded that full drainability of the water side would be a highly desirable feature of future steam generators.

In addition to the steam generator, CRIEPI asked for and was given samples of primary sodium, an irradiated control rod, and a number of metallurgical samples from the surveillance subassembly. These were examined in detail in Japan and a complete test report on the result was published. This and the report on the steam generator were made available in the U.S. through a document exchange program. The Japanese recognized the operating experience value of making these examinations and also of recording the decommissioning story that was partially paid for by them, the value of all this was only belatedly recognized by the AEC.

After resumption of operation in July 1970, plant operation was primarily limited by first-core fuel considerations, such as irradiation-induced creep in stainless steel which, along with stainless-steel swelling, are among the important core design considerations for future fast reactor cores. These effects at Fermi could have caused a misalignment between the holddown fingers and the fuel subassembly handling heads. From an operational view, it was necessary to measure subassembly bow, both in magnitude and direction, after raising the holddown. New reloading patterns had to be devised and carried out before the holddown lowering and operation could take place. Techniques and equipment to make these measurements with a high degree of accuracy were developed, but very extensive and time-consuming fuel handling was necessary.

Some very useful basic data on irradiation-induceed creep in the Fermi neutron flux level of 5×10^{15} were obtained. This neutron flux was 50 percent greater than that in any other operating fast reactor. Problems arising from creep were to have been provided for in the second or oxide core program, by fuel design, and by the addition of a core restraint system. Because of limited Core A fuel life, operation at power was reserved for essential test operations and important demonstrations.

COMPONENT AND SYSTEMS EXPERIENCE

Operating experience with the plant after July 1970 generally demonstrated that all components and systems were functioning properly and reliably. This would certainly apply to the primary and secondary pumps, which logged tens of thousands of hours, to the intermediate heat exchangers, to the new fuel transfer facility, to the plant safety systems, to the primary soium service systems (including the cold trap and plugging temperature meter), to the cover gas and waste gas systems, and to the discharged fuel handling and cleaning equipment that was used extensively in readying spent fuel for return to the Atomic Energy Commission (AEC). The exceptions where concern still existed were the No. 1 steam generator and, of course, the long-recognized need for an improved (or second) core design and new fuel supply. All other plant components and systems appeared to be satisfactory for use at the plant design power level of 430 MW(th). The Core A fuel was designed for an limited by the operating license to a maximum of 200 MW(th); this power level was successfully achieved.

MAINTENANCE OF LARGE SODIUM SYSTEMS

Demonstration of the ability to maintain large sodium systems was one of the major hurdles to the acceptance of LMFBR plants by the utility industry. The Fermi Project demonstrated this capability over a period of 12 years in a plant operated and maintained by electric utility company personnel. This maintenance history was thoroughly documented in a series of about 240 maintenance reports.* The experience covers the whole range of maintenance operations, from normal maintenance operations such as replacement of pump seals and maintenance of control rod drives, to the very extensive and complex recovery operations associated with the October 5, 1966 fuel melting incident. The Fermi Plant maintenance staff developed great competence and confidence in its ability to maintain large sodium systems in a routine manner. This maintenance experience has been used by every fast reactor design that followed Fermi.

THE FUEL MELTING INCIDENT

The fuel melting incident that occurred on October 5, 1966 had an enormous impact on the Fermi Project in terms of time delay and cost. Nevertheless, the investigations and repairs that followed provided valuable information for subsequent designs, and for the Fermi Plant itself, when operation was successfully resumed nearly four years later. While the Fermi Project suffered a major loss as a result of the incident, the nuclear industry and, ultimately, the nation benefited technically from what was learned.

Most importantly, the incident demonstrated that thoughtful preparation for reasonable malfunctions, coupled with a design philosophy that incorporates redundancy and defense-in-depth, provides a safeguards envelop that will respond adequately to a real accident and provide ample margin between actual consequences and public harm, even though reactor accidents seldom occur or progress exactly as envisioned during design.

The maximum credible accident had been defined by PRDC as complete blockage of one subassembly at full power and by the AEC as blockage of two subassemblies. The predicted most likely accident course was rapid melting and ejection of fuel from the core, followed by automatic scram due to the resulting rapid power drop. Consequences of such an accident would pose no public or plant personnel hazard. The real accident involved a slower partial melting of only part of the fuel in two adjacent subassemblies. It was detected by anomalous reactivity loss and radiation release to the containment followed by manual reactor shutdown. The consequences posed no public or plant personnel hazard.

DECOMMISSIONING

Major retirement activities and the plan for maintenance of the plant in perpetuity formed the framework of the decommissioning program. These major activities were:

1. Return of the leased enriched uranium to the Energy Research and Development Administration (ERDA) (formerly the AEC);
2. Shipment of all radioactive blanket subassemblies to ERDA for disposal;
3. Removal of radioactive sodium from the primary sodium system for eventual delivery to the CRBRP;
4. Removal and disposal of the nonradioactive secondary system sodium;
5. Chemical treatment of residual sodium in the primary and secondary sodium systems to a passive material;
6. Dismantling most of the slightly contaminated equipment located outside the reactor building and shipment of such material off site to a licensed burial facility;
7. Installation of monitoring instrumentation in the reactor and fuel and repair buildings;
8. Rerouting the facility boundary fence to enclose only that region containing residual radioactive material;
9. Plant maintenance in perpetuity including: the installation of instrumentation to promptly identify the existence of potentially deleterious conditions, storage of radioactive materials within buildings of high integrity, and continuing periodic surveillance;
10. Establishment of administrative controls for authorized entry to restricted areas and for preparation of environmental, unusual events, and annual status reports.

Decommissioning of the Fermi Plant was essentially complete by December 31, 1975. Fermi's decommissioning plan was unique in that it was greatly influenced by the following factors:

1. Installation by The Detroit Edison Company of a 1100-MW(e) boiling water reactor adjacent to the Fermi Plant site;
2. Use of the Fermi turbine for peaking by The Detroit Edison Company utilizing a fossil-fueled boiler;
3. The $4 million retirement fund held in reserve by PRDC.

Furthermore, there were no guidelines available from the AEC regarding decommissioning a sodium-cooled reactor, even though such sodium- or sodium-potassium-cooled reactors as HALLAM, SEFOR, and EBR-I had been or were then concurrently being decommissioned. Studies had to be made by the AEC on what to do with the irradiated blanket elements and the radioactive primary system sodium. These studies were primarily responsible for the lengthy period required for decommissioning.

In addition, decisions had to be made regarding the administration of a decommissioned site. Minor residual radioactivity that was still present was more than adequately rendered inaccessible and inescapable and is well monitored.

These decommissioning decisions are examples of just a few of the many that had to be made in shutting down the Fermi Project. Even during plant dismantling and decommissioning, it was contributing to the LMFBR program by assisting in the establishment of design criteria for decommissioning such reactors.

FERMI PRECEDENTS

A number of important precedents were set by the Fermi Project. Among them were the establishment of legal precedents, particularly those related to licensing, the cooperation of many major industries, and personnel training that benefited reactor programs worldwide.

LEGAL PRECEDENTS

In a series of court cases extending over a period of five years, many of the major legal points concerning the U.S. nuclear power program were developed and have remained as precedents to this day. An AEC conditional construction permit was issued to Power Reactor Development Company (PRDC) on August 4, 1956, and on August 31, 1956 a petition was filed by several intervenors to oppose the issuance and continuation of the construction permit, contending that the necessary showing of safety and financial qualifications had not been made. In many respects, Fermi served as a test case paving the way for future nuclear power development by private industry, since the

U.S. Supreme Court, in an historic decision on June 12, 1961 sustained the AEC and PRDC on every point of contention.

Concurrent with construction permit litigation, the AEC was breaking new ground in its regulatory processes. The construction permit was conditional on the ability of PRDC to satisfy various questions raised in June 1956 by the Advisory Committee on Reactor Safeguards (ACRS). The ACRS observed that in view of the early state of nuclear technology, much additional information had to be developed. This information was provided during the ensuing design and development period and led to ACRS letters of support for the low- and high-power operating licenses issued in October 1963 an December 1965, respectively. In issuing these licenses the AEC developed guidelines and regulations that would serve in licensing future nuclear power plants.

COOPERATIVE EFFORT ON A MAJOR PROJECT

An industry-wide cooperative effort on the scale of the Fermi Project was a first-of-its-kind for the utility industry since it involved so many companies. Initial involvement consisted of 23 electric utility and industrial companies firmly committing $23 million to the project. It represented an example of what can be accomplished by unified action of the utility industry in pooling resources and coordinating efforts for the accomplishment of major projects and research and development programs.

The proposed Clinch River Breeder Reactor Project (CRBRP) would go a step beyond the Fermi Project in this respect, since it involves most of the privately owned electric utilities in the U.S. with $250 million participation by the utilities. However, at the present time there is considerable doubt as to whether this project will ever be completed.

PERSONNEL TRAINING

Personnel training was one of the most useful and worthwhile accomplishments of the Fermi Project. It was one of the principal purposes of the project from the beginning. A strong spirit of international cooperation developed. More than 250 U.S. and foreign personnel obtained practical experience in nuclear power plants through the Fermi Project. Scientists and engineers came from U.S. electric utility companies and U.S industry, as well as from organizations in ten countries overseas, including electric utility, industrial and governmental organizations. Many returned to assume important responsibilities in the nuclear work of their parent organizations.

The LMFBR technological background invested in these people has been and is now being applied to LMFBR projects around the world, including the Rapsodie, Phenix, and Super Phenix Projects in France, the Prova Elementia Combustible Project in Itlay, the SNR Project in West Germany, Belgium, and Holland, the JOYO and MONJU Projects in Japan, as well as the FFTF and the Clinch River demonstration plant in the U.S.

Many of those who received training through the Fermi Project are recognized leaders in the nuclear power field, in both LMFBR and commercial light water reactor programs. It is through these many people that experience gained in the Fermi Project has been and will continue to be usefully applied in developmental work leading to commercial LMFBRs. Chapter 16 shows, to the extent possible, the origin and destination of Fermi Project personnel.

OVERALL SIGNIFICANCE

Until recently, one of our nation's research and development targets was to achieve commercial-scale fast breeder reactors by the end of this century. Of the various breeder concepts, the one on which much work has been done in the U.S. and overseas is the Fermi type, the piped sodium-cooled fast breeder. In January 1972, the Federal Government selected the Commonwealth Edison Company and the Tennessee Valley Authority to build the next-generation reactor of this type, the 350-MW(e) Clinch River demonstration plant. The reactor was planned for completion in the 1980s. Observers believe that the development and operation of Fermi has done much to create a base for and acceptance of such a project by the industry. Preliminary design also indicates the use of various key design concepts demonstrated in Fermi.

At one time, the U.S. was well ahead of other countries in fast breeder reactor technology. Today, the USSR, France, and England have operational demonstration plants in the 250- to 350-MW(e) range. A unit of 1200 MW(e) is planned for the early 1980s in France. Research and development are under way in other countries. A Belgian, Netherlands-German group is building a 300-MW(e) plant. Japan has completed an experimental reactor, JOYO, and is ready to construct a large demonstration plant, MONJU.

The U.S. is behind. This was recognized early in 1970 when those most closely associated with Fermi saw a new mission for the Fermi Project.

Power Reactor Development company developed a six-year research and development program for the operation and improvement of Fermi, built around an advanced fuel loading composed of uranium oxide, with the use of some uranium-plutonium fuel elements. The new six-year program would have permitted further experience in operating a fast breeder on an electric system, a higher neutron flux for testing advanced fuels and material specimens, additional operation of the steam generators, and opportunities to work with sodium and the various systems of measurement, control, and routine operation. The new fuel and higher power program would also have allowed more engineers from the U.S. and abroad to gain practical experience with a fast breeder reactor.

There were excellent reasons for proceeding with the Fermi oxide core program in 1970 in support of the FFTF and the CRBRP. The FFTF was not scheduled for completion before 1977 and the Clinch River demonstration plant would not have been operational before 1980. These plants have now been rescheduled for the 1980s and the 1990s, respectively. Meanwhile, several other industrial nations were rapidly forging ahead. It was clear to PRDC that the design, construction, and training of personnel for the U.S. demonstration reactor had much to gain from the availability of Fermi with a new core loading that would permit operation at power levels up to it 430-MW(th) design capability.

The estimated cost of the oxide core program was about $50 million. In August of 1971, a memorandum of understanding was established with the AEC for a waiver of use charges on the nuclear fuel, providing the AEC with the option of later assigning various experiments to the reactor. The memorandum received Congressional approval, but a definitive contract was subject to the ability of PRDC to raise some $41 million from other sources. About $30 million was promised or pledged by private utility systems in the U.S. and by groups in Japan and Europe. Further efforts to obtain the remaining funds, including a request to the AEC to increase their support, were not successful.

On November 27, 1972 the PRDC Executive Committee reluctantly decided to decommission the Fermi Plant because of the inability to totally fund the proposed six-year oxide core program. Thus began the closing chapter of the history of the first fast breeder reactor demonstration plant in the U.S. From the beginning, Fermi was a farsighted, very ambitious, pioneering project supported almost entirely by U.S. private industry.

The vision of Fermi's supporters has been borne out by subsequent developments in the worldwide search for an economic, clean, unlimited energy source, which now finds the fast breeder reactor a priority program in most of the world's major industrial countries. The thrust of these programs has now taken a different direction. The questions to be answered are not whether the breeder can be developed commercially, but rather, how long will it take, can it be economically competitive, and how successful will the industry be in convincing the general public of the safety and necessity for the breeder in meeting long-range energy demands? Recently, answers to these questions have been complicated further by anti-proliferation goals which could have a major impact on all LMFBR programs.●

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[1] James P. Lagowski is supervisor of Resources and Facilities Planning, The Detroit Edison Company. He was associated with APDA from 1966 to 1971.

[2] Walker L. Cisler in a PRDC press release of November 29, 1972.

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[3] Many Japanese personnel are listed in Appendix D as contributors to APDA-215.

[4] A complete set of these maintenance reports was given to the Electric Power Research Institute Library, Palo Alto, Calif.

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PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, THURSDAY, JUNE 16, 1983 No. 86

Senate

ALTERNATIVE FINANCING FOR CLINCH RIVER—UTILITY REGULATORS UNENTHUSIASTIC

● Mr. HUMPHREY. Mr. President, as I mentioned in my RECORD entry of June 13, the alternative financing proposals that proponents of the Clinch River breeder reactor project have presented are by the Department of Energy's (DOE's) own admission "simply moving money around in time." Again, as the Assistant Secretary for Nuclear Energy at DOE has emphasized, the only way to find out if industry is truly interested in supporting the Clinch River project is to have them put much more of their own money on the line in the form of contributions.

Getting the nuclear industry to do this now when they face so many financial problems and have so many more attractive ways to spend their money is a tall order. Indeed, given industry's repeated admission that it has no desire to contribute any more money than it has already pledged to the project—$257 million—increased industry contributions seem highly unlikely.

The point that has not yet been made, however, is that the future of alternative financing is not simply up to the nuclear industry, that even if the utility industry should change its mind and try to contribute more to the Clinch River project, the State regulatory utility commissions have the final say.

According to a formal reply to an inquiry of mine, the National Association of Regulatory Utility Commissioners (NARUC), though, has serious reservations about approving any sort of alternative financing for the project. Specifically, it does not see how utilities could justify increased contributions to the project when so many have increased their rates and are strapped for cash. Also, it does not believe that Federal tax benefits to those that might invest in the project is any plus for the ratepayer. As NARUC makes clear, the ratepayers already carry a heavy load through rates for utilities' deferred income taxes and investment credits.

Given these difficulties, NARUC believes that the Federal Government should assume all funding for the Clinch River breeder reactor project. As NARUC notes:

> It would appear more appropriate for the Federal government to finance the Clinch River Breeder Reactor in its entirety than to burden the electric utility industry with a portion of its cost. If the project is worthwhile, then it should receive no less Federal support than the billions spent for domestic synthetic fuels technology.

Mr. President, I will not go into the unworthiness of the Clinch River project here much less that of the synthetic fuels program. But if NARUC, the key national organization representing public utility commissions, questions the wisdom of any cost sharing plan for Clinch River, I think it is important that the Senate understand the reasons. Indeed, without the support and approval of the Nations' State utility commissions, alternative financing or any sort of utility contributions will run into serious trouble no matter what the utility industry itself decides.

Mr. President I ask that the full text of my correspondence with NARUC on this issue be printed in the RECORD.

[The material follows:]

IOWA STATE COMMERCE COMMISSION,
Des Moines, Iowa, June 13, 1983.

Hon. GORDON J. HUMPHREY,
U.S. Senate,
Washington, D.C.

DEAR SENATOR HUMPHREY: Your letter concerning questions public utility commissions might have to proposals to increase the utilities' investment in the Clinch River Breeder Reactor sent to Paul Rodgers, General Counsel of the National Association of Regulatory Utility Commissioners, has been referred to me for consideration. As Chairman of both the NARUC Committee on Electricity and the Iowa State Commerce Commission, Andrew Varley informs me that no official position on the issues concerning Clinch River has been taken; however, I can relay to you several questions and problems that occur to me as a state regulator with the conclusions formulated by the Department of Energy and Breeder Reactor Corporation regarding alternative financing possibilities.

Many regulatory agencies, by state law or regulatory precedent, either limit or do not allow utilities under their jurisdiction to recover from current ratepayers the cost of plant held for future use or construction work in progress. Some of these same jurisdictions are facing the issue of how to cope with the current and future costs of existing excess capacity and abandonment or termination of power projects that will still be a problem at the projected in-service date of the breeder reactor. To ask the nation's utilities (and ultimately the ratepayers) to invest an additional $800 million in the project during this period of financial uncertainty seems harsh.

Other concerns that state regulatory agencies may have about the Clinch River Breeder Reactor project involve uncertainties as to proper licensing safeguards, efficient construction methods, high construction costs, specific completion date, level of capacity factor, proper level of operation and maintenance expense to be charged, and market potential for energy produced. In addition, while it has been suggested that the Federal government offer enhanced tax benefits to utilities for financing the project, the fact is that the nation's utility customers already carry a heavy load through rates for deferred income taxes and investment credits.

It would appear more appropriate for the Federal government to finance the Clinch River Breeder Reactor in its entirety than to burden the electric utility industry with a portion of its cost. If the project is worthwhile then it should receive no less Federal support than the billions spent for domestic synthetic fuels technology.

Thank you for asking for the opinions of state regulators on this important issue. If Chairman Varley and I can be of further assistance to you on this matter, do not hesitate to ask.

Sincerely,

JAMES E. WILSON,
Director, Public Utilities Division.

U.S. SENATE,
Washington, D.C., April 6, 1983.

Mr. PAUL RODGERS,
General Counsel, National Association of Regulatory Utility Commissioners, ICC Building, Washington, D.C.

DEAR MR. RODGERS: I know that your Association has no formal position on constructing the Clinch River Breeder Reactor but I hope you might give me guidance on the sorts of questions public utility commissions might have to proposals to increase utilities' investment in Clinch River.

As you know, the Department of Energy and the Breeder Reactor Corporation recently completed studies on how the utilities might be induced to increase their investment in the project (see the enclosed conclusions of the Breeder Reactor Project). The key idea emphasized in these studies is that the utilities should invest some $800 million more dollars now to secure the benefits of the electricity sales that will be made from the plant's operation later. To encourage such investment, the studies suggest that the U.S. government guarantee that the Clinch River Project will be completed, that it will operate at projected capacity factors, and that its electricity will sell at projected prices. In addition, the studies suggest that the government offer the utilities enhanced tax benefits for investing in the project.

Would the public utility commissions challenge the utilities if they came to ask permission to participate in such a scheme? If so, what sort of concerns might the commissions have?

If you could write to us supplying answers to these questions, it would be much appreciated. My assistant, Henry Sokolski at 224-8766 is working this issue. Please feel free to call him for additional background.

With best regards, I am
Sincerely yours,
GORDON J. HUMPHREY.

NATIONAL ASSOCIATION OF
REGULATORY UTILITY COMMISSIONERS,
Washington, D.C., April 22, 1983.

Re Investment in the Clinch River breeder reactor

Hon. GORDON J. HUMPHREY,
U.S. Senator, Hart Senate Office Building, Washington, D.C.

DEAR SENATOR HUMPHREY: Thank you very much for your correspondence of April 6, 1983, inquiring as to State regulatory attitudes toward utility investment in the Clinch River Breeder Reactor.

Due to the subject, I am referring your correspondence for consideration and response by the NARUC Committee on Electricity, which is chaired by The Honorable Andrew Varley of Iowa. His address and telephone number are as follows:

Hon. Andrew Varley, Chairman, Iowa State Commerce Commission, Lucas Building, Des Moines, Iowa 50319 (515) 281-5167.

We deeply appreciate your thoughtfulness in soliciting the State viewpoint in this important issue.

With warm personal regards and best wishes I am
Sincerely yours,
PAUL RODGERS,
General Counsel. ●

United States
of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, WEDNESDAY, JUNE 22, 1983 *No. 89*

Senate

Mr. HUMPHREY. Mr. President, I wonder if I might engage the chairman of the Appropriations Committee in a colloquy relative to the committee language in this bill on the Clinch River project.

Mr. HATFIELD. I will be very happy to respond to the Senator.

Mr. HUMPHREY. I thank the Senator. I know the chairman is aware of my concern and that of other Senators regarding Clinch River. We have made an effort over the years to terminate this project.

Mr. President, the appropriations bill before us contains no funding for the fiscal year 1984 for the Clinch River breeder reactor demonstration project. It is my wish to further clarify language for the information of the Department of Energy. Let me ask a few questions of the chairman at this point, if I might.

As the chairman knows, the continuing resolution for fiscal year 1983 prohibited any construction. Because the committee report of this bill continues this program for fiscal year 1984, I ask the chairman of the Appropriations Committee, is it correct that no money is available for construction of the project, the Clinch River project, in fiscal 1984?

Mr. HATFIELD. The Senator is correct. There is, in fact, a specific prohibition in the language that indicates the committee's feeling and view about the matter, to prohibit that.

Let me be very frank with the Senator. We have both been in the political business long enough to know that bureaucrats are determined to circumvent the will of the Senate, the House, or the Congress. They go into definitions of what is construction, for instance. Some may view construction as merely new construction, whereas others may say it is replacement and does not constitute new construction, in a sense.

Let me just say that my understanding is that the prohibition includes not only the reactor building itself but also any support facilities and all support facilities. I would just like to make that record further with the Senator from New Hampshire. As he knows, he and I stand shoulder to shoulder on this issue, on the same side of it. But I believe that is the legislative record, and I am happy to reiterate it today.

Mr. HUMPHREY. I thank the chairman. He is absolutely correct, that we should make absolutely clear that the legislative intent of the language is to prevent some executive department from going around the legislative intent. I might say that my understanding of the word "construction" includes not only the reactor building but any support facilities, as the chairman has verified.

Let me ask the chairman further if any new activities would be permitted by the language in this appropriation bill? Would leveling and mud mats, vertical backfill concrete, and construction of waterproof membrane be permitted by this language?

Mr. HATFIELD. It is the intent of the committee to bar the initiation of any such construction activities in fiscal year 1984 unless an alternative financing plan is approved.

Mr. HUMPHREY. The answer to my question, then, is no, they would not be permitted?

Mr. HATFIELD. They would not be permitted.

Mr. HUMPHREY. Or construction for a barge facility?

Mr. HATFIELD. No, that would not be permitted.

Mr. HUMPHREY. Construction of a railroad?

Mr. HATFIELD. That would not be permitted.

Mr. HUMPHREY. And onsite office building?

Mr. HATFIELD. That would not be permitted.

Mr. HUMPHREY. And onsite warehouse?

Mr. HATFIELD. That would not be permitted.

Mr. HUMPHREY. To start construction of nuclear island mat, including cell liners?

Mr. HATFIELD. That would not be permitted.

Mr. HUMPHREY. Work on sewage treatment plant or plants?

Mr. HATFIELD. That, again, would be outside the understanding of the committee to prohibit all construction.

Mr. HUMPHREY. Or erection of the containment vessel?

Mr. HATFIELD. Again, that would be outside the permitted activity. In other words, that would not qualify.

Mr. HUMPHREY. I thank the chairman for his responses. It is the intent of the committee, I take it, to stop construction completely in any sense of the word.

Mr. HATFIELD. The Senator is correct.

Mr. HUMPHREY. I thank the chairman.

Could the Department of Energy be free to obligate itself to new contracts for work on any aspect of the project before a cost-sharing bill was enacted?

Mr. HATFIELD. No. It is our intent that DOE would not obligate on these contracts.

Mr. HUMPHREY. And, finally, does the committee's language "If an alternative financing arrangement can be worked out among the interested parties," mean if an authorizing bill is enacted by Congress?

Mr. HATFIELD. Let me state to the Senator that on that type of situation, we in the Appropriations Committee do not seek to take on problems that we do not already have. Therefore, we would prefer to have that type of thing go to the authorizing committee and for them to have hearings and make that determination.

I must also say for the total record, that, as the Senator knows, when you get into a CR situation, a continuing resolution situation, which, unfortunately, we may have to face again this year at some point on the bills which have not been acted upon, anything can happen on a CR and usually does. But I would resist it, as chairman of the committee.

I just want to make sure that the Senator understands that there are all kinds of loopholes, and I would join him any time he finds one that I do not find.

Mr. HUMPHREY. The purpose of my question was to determine whether or not the committee expects the Department of Energy to come before some committee of Congress to obtain approval of an alternative plan.

Mr. HATFIELD. That is correct. Again, I must say that we have authorized these sometimes in terms of CR's.

Mr. HUMPHREY. I understand that, Mr. President. In any case, under the committee report language, the Department of Energy must come before the Congress to obtain approval of alternative financing schemes. Is that correct?

Mr. HATFIELD. That is correct.

Mr. HUMPHREY. The Department of Energy must obtain the approval of Congress.

Mr. HATFIELD. That is correct. That would have to have approval. The form it would take, in my preference, would include the authorizing committee. If they come at us from another angle, that is another thing I have no way to prevent. I just want to say that as far as this committee is concerned, that is the procedure we are going to require through the normal committee activities.

Mr. HUMPHREY. I just want it understood that we do not want the Department on its own to determine an alternative financing scheme that the committee does not approve.

Mr. HATFIELD. I agree with the Senator.

Mr. HUMPHREY. I thank the chairman of the committee for his assistance.

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Congressional Record

PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, TUESDAY, JUNE 28, 1983 No. 92

Senate

CLINCH RIVER—THE RAND REPORT IS IN

● Mr. HUMPHREY. Mr. President, by withholding funds until industry contributes more, the Senate last week took a major step toward resolving the controversy surrounding the Clinch River breeder reactor project. I think that as soon as industry's plan is presented and hearings are held, the difficulty of such schemes vis-a-vis the State public utility commissions will become clear. Given industry's lack of venture capital and utilities' difficulties in completing construction work in progress, the last thing State utility commissions are going to want their utilities to do is invest more money into distant demonstration efforts such as Clinch River. Certainly, it would be embarrassing if Congress approved alternative financing only to find 2 years later that the public utility commissions are unwilling to allow any industry funds to move.

There are, however, more substantial reasons for Congress to refuse to participate in alternative financing for the project. In specific, demonstrating commercial-sized breeders now is both economically and technically premature.

I have argued this before but it is frequently brushed aside. It ought not to be. Indeed, recently Senator HEINZ and I asked the Rand Corp. to evaluate the merits of proceeding with the project. We did this because so many claims have been made by both sides and because the Rand Corp. was the one consultant firm both sides saw fit to cite.

The Rand Corp.'s reply, authored by its president, Dr. Donald Rice, was blunt and to the point. Arguments about how technically advanced the project is are largely irrelevant and ultimately leads down blind policy alleys. Nor should the debate focus on how the project's design compares to that of its foreign competitors. "This issue," Dr. Rice notes, "should not be permitted to distract attention from more serious matters that bear directly on whether to continue the project."

Again, the key question with regard to Clinch River is whether or not it is the "best path to meeting long-term national energy goals and a sound strategy for insuring that nuclear energy supply options are available." The Rand Corp.'s answer here is no and the reason why is simple: Before the project might make sense, five conditions would need to be met and none are yet present.

The first condition is that there be high growth in electricity demand for the next 20 years, as high as estimates made in the early 1970's. The seond is that there be a large and growing fleet of light water reactors. When Clinch River was first conceived the assumption was that there would be nearly 1,200 reactors on line by 2000, not 150. The third is substantially higher uranium prices than those now current or projected through the year 2020. The fourth is the availability of inexpensive light water reactor fuel reprocessing plants, none of which now exist. And finally the absence of better breeder alternatives, which now even Secretary Hodel has expressed doubt about.

Mr. President, I think it is important that Congress understand that what justified Federal support for the Clinch River breeder reactor back in the early 1970's no longer makes sense. I ask that the Rand Corp.'s evaluation of the project's merits, the original request that Senator HEINZ and I made, and the joint "dear colleague" we sent out last Friday concerning the report be printed in the RECORD.

The material follows:

RAND,
Santa Monica, Calif., June 9, 1983.

Hon. JOHN HEINZ,
U.S. Senate,
Washington, D.C.

DEAR SENATOR HEINZ: Your letter of 13 May asked that we assess the adequacy and sophistication of the technology demonstrated in the Clinch River Breeder Reactor Project and estimate its importance to a national breeder reactor program. The discussion that follows reflects the views of several of our experienced staff on these issues. As you will see, we believe that the first issue is not the right question. The sophistication of the technology embodied in the Clinch River Breeder Reactor (CRBR) is discussed below. But it cannot settle the question of whether the CRBR project should be continued. Instead, the fundamental issue is whether the present CRBR project and LMFBR program are essential to and consistent with national energy requirements. I will first discuss why we feel that technological sophistication should not be the focus of Congressional concern, then suggest criteria for assessing the project's national importance and reaching a judgment on whether it should be continued.

TECHNOLOGY OF THE CRBR

Disagreements about the CRBR technical design have two dimensions. First, several of the design features that Westinghouse mentions are more advanced than comparable features of the five principal breeder reactor design favored elsewhere in the world. But it is also true that the general conceptual design of the CRBR stems from the late 1960s, although detailed design began only in 1974. Of course, the foreign designs all date from the same era.

Second, it is not the case that newer design features are necessarily better than older concepts. Incorporating such features entails a tradeoff between potential improvements and risks. For example, Westinghouse emphasizes that the upper intervals of the reactor vessels are Inconel clad, which substantially improves their life expectancy. The 1979 White House Paper argues that this innovation is a liability, pointing out that because the selected alloy cannot be welded with present technology, the system must incorporate mechanical fasteners that cost more and complicate the design. Both observations are basically correct and reflect the best technical judgments of different experts. Only time will tell whether higher cost and complexity outweigh longer component life, or vice versa.

The CRBR could undoubtedly be made to appear more attractive (less costly, more productive, safer, etc.) by incorporating different design features. But this is true of any new technology. At some point, any new project must freeze the key design features. Moreover, experience with nuclear installations in the U.S. and elsewhere suggests that the theoretical promise of new design features is often not fulfilled.

For these reasons, we believe that the Congress should not concern itself with how the CRBR design compares to that of its foreign competitors. In fact, this issue should not be permitted to distract attention from more serious matters that bear directly on whether to continue the project.

CRITERIA FOR ASSESSING NATIONAL IMPORTANCE

As suggested above, the fundamental issue is whether the CRBR project, and the program of which it is a part, constitute the best path to meeting long-term national energy goals and a sound strategy for ensuring that nuclear energy supply options are available as needed. Another way of stating the issue is to ask how the United States can best invest its R&D resources so as to ensure an adequate electricity supply in the next century. Only if we could reasonably expect the costs of electricity from the combination of LWRs and LMFBRs to be less than the cost of alternative systems of supply—nuclear or non-nuclear—does the CRBR project make sense. A number of conditions must be met if that lower cost of electricity criterion is to be achievable.[1] They include:

High growth in electricity demand the next two decades,

A large and growing number of light water reactors in operation during the '80s and '90s,

Uranium prices were forecast to be much higher than current prices,

Cost effective reprocessing capability for both LWRs and LMFBRs, and

The absence of better breeding alternatives.

At this time, neither we nor most observers believe that any of these conditions hold. I will discuss each in turn.

(1) Projections of national energy requirements have changed radically since the early 1970s. The Department of Energy (DoE) recently released data indicating that per capita consumption of energy fell last year to its lowest level since 1967. The DoE currently estimates that electricity consumption will grow at less than four percent a year for the remainder of this decade. That is roughly half the growth rate predicted by ERDA when the CRBR design was stabilized in 1974. These estimates reflected the classical (and erroneous) assumption that total energy demand was solidly coupled to GNP growth, independent of the relative price of energy. But the amount of energy needed to produce a specified increment of GNP growth has fallen appreciably since 1974, and by 1990 it promises to decrease by another 20 to 30 percent. As early as 1975 I reported to the head of ERDA that the electricity demand assumptions used in economic justifications of the CRBR project appeared to be much too high and suggested halving the estimates. Experience of the past eight years has indicated that my estimate still overstated growth in demand.

(2) If earlier demand projections had been correct, it is at least possible that the number of LWRs in the United States would have continued to grow at a rapid rate. In fact, however, the LWR industry has taken a profound and lasting downturn beginning in 1974—the last year in which a nuclear power plant was ordered in the United States. Since then, scores of reactor projects have been canceled, including some under construction. This downturn stems not only from the decrease in electricity demand but also from the relentless increase in LWR capital costs.[2] Thus the LWR population is not expanding. Without a large and expanding population of light water reactors, a breeder to produce fuel for LWRs loses its justification.

(3) The basic premise of the LMFBR program is the assumption that nuclear fuel will be needed for a large number of electricity-generating reactors in the early years of the next century. However, although esti-

mates vary, the expectations of the early 1970s that economically accessible uranium sources would be largely exhausted by the 1990s have proved unfounded. If sufficient uranium to support the nuclear plant inventory of the early 21st century can be obtained more cheaply than the plutonium generated CRBR-type plants, there is no economic justification for continuing the present line of LMFBR development. An alternative technical approach that provided a higher assurance of sound economic return could be attractive.

(4) It is also necessary to acknowledge explicitly that a commitment to breeder reactors is also a commitment to reprocessing for both light water reactors and for breeders. Developing that essential reprocessing capability may be as difficult as developing the breeder reactor itself. The associated waste disposal, fuel transport, nuclear safety, accountability, and security issues all require demonstrated solutions, currently lacking.

Because economical LWR reprocessing is essential to breeder economics, it is reasonable to argue that a native reprocessing capability for nuclear fuel should have a higher priority than a breeder reactor. Such reprocessing can substantially extend the availability of fissile fuel, even without breeder development. Thus demonstrating the existence of acceptable solutions to reprocessing problems is at least as important as acquiring a functional breeder demonstration plant.

(5) Even if the first four conditions could somehow be met, it is still not clear that an LMFBR is the most promising nuclear power generation technology. Rand and other institutions have suggested several alternatives to the LMFBR. One is the accelerator breeder concept that would result in breeding plutonium from a uranium fuel cycle, or fissile uranium from a thorium-based fuel cycle. For the long term, an even more promising breeder concept may be the hybrid fusion system, which like the accelerator breeder could breed reactor fuel while not coupled to a power producing reactor. The uncoupled breeders also lend themselves to the support of improved fission power reactor systems of several types.[9] "Improved" fission reactors have, among other improvements, higher conversion ratios than current LWRs.

Since none of the five conditions has been met, we feel that the current strategy for breeder development cannot be justified on economic grounds and is also extremely problematic on grounds of energy security or "keeping options open."

As I mentioned briefly above, almost eight years ago the director of ERDA, concerned about the validity of the CRBR project, asked me to review its status and prospects. In response, I urged a cautions, sequential approach that, in time, could demonstrate whether the technology was appropriate, the need sufficient, and the potential cost reasonable. (See enclosed Paper) Time has passed, and the probable cost has grown, the national need for the project still remains to be confirmed, and the technology remains controversial. In addition, it seems apparent that the currently proposed schedule for the CRBR and follow-on LMFBR facilities is insufficiently consistent with the potential availability of reprocessing facilities. In view of the lessened apparent urgency of the CRBR project and its clearly diminished role in the national energy program, I would again urge that the nation explore its technical options and possibilities, and that we eschew committing ourselves to the CRBR and the strategy that it embodies.

I would recommend that the Department of Energy be asked to develop an alternative, lower cost R&D program that emphasizes step-by-step sequential development of several technical approaches, pointing toward a much later deployment time than that currently envisioned for the LMFBR.

Sincerely yours,

Donald B. Rice,
President.

U.S. Senate,
Washington, D.C., May 13, 1983.

Dr. Donald Rice,
President, the Rand Corp.,
Santa Monica, Calif.

Dear Dr. Rice: During the last two years there has been considerable congressional debate over continued federal support for the Clinch River Breeder Reactor Project. One of the key issues in this controversy has been whether or not the project's design is obsolete. Those who are opposed to the project argue that the reactor's design is obsolete and that the project is not necessary to our breeder research and development program. Those who favor the project argue that it is the most advanced reactor design in the world and that the project is essential to our breeder reactor research and development efforts.

It is important that we have the best information possible on this question. We believe that the RAND Corporation can be of help. Your corporation has done extensive work for the Department of Energy and the Nuclear Regulatory Commission concerning the nuclear fuel cycle, nuclear safety, and licensing and safety issues associated with the liquid metal fast breeder reactor. Several of these studies—"Some Implications of the Three Mile Island Accident on LMFBR Safety and Licensing: The Design Basis Issue," "A Review of Cost Estimation in New Technologies," "Anticipated Transients Without SCRAM for Light Water Reactors: Implications for Liquid Metal Fast Breeder Reactors"—have been cited by both sides of the Clinch River debate. Given the fair and thorough work your corporation has done in these areas and the widespread respect its work is accorded, we hope your staff would comment on the enclosed materials.

The first set of materials—a white paper prepared for the Congress May 11, 1979 by the White House—argues that the Clinch River Breeder Reactor's design is obsolete. These materials also argue that the project is not essential to the U.S. having a sound breeder reactor research and development program.

The second set of materials—Department of Energy documentation along with materials presented by the Westinghouse Electric Corporation—argues that the Clinch River Breeder Reactor has the most advanced breeder design in the world and that the project is essential to our long term breeder reactor research and development effort.

We are at a loss to evaluate these materials by ourselves—although we know that they could not all be correct—and would appreciate it if your staff would critique both sets of material. If this analysis could help us answer the questions of how advanced the project's design is and how essential the project is to our long term breeder reactor research and development program, it would be of tremendous public service.

With warmest regards, we are

Sincerely,

Gordon J. Humphrey.
John Heinz.

U.S. Senate,
Washington, D.C., June 24, 1983.

Dear Colleague: During the last two years, there has been considerable Congressional debate over continued federal support for the Clinch River Breeder Reactor Project. Controversy has centered not only on the project's design but also on the basic question of the need for a breeder demonstration project at this time, considering the nation's real energy needs and rising budget deficits.

In an effort to answer several of the questions which have been asked about Clinch River, we recently asked the Rand corporation to provide an independent assessment of the Clinch River Project. The findings of the Rand study (which is enclosed for your review) lead us to conclude that it would be difficult to justify continued federal funding for the Clinch River in the absence of a viable industry cost sharing plan.

The FY '84 Energy and Water Appropriations bill provides no funds for the Clinch River Breeder Reactor. The Senate report accompanying the legislation states, "Until an alternative financing arrangement is enacted no funds should be obligated or expended for additional major equipment orders or construction on any permanent structures or facilities." We believe this is good policy. Although it is necessary to maintain a balanced national energy program including important research and development activities for breeder reactor technologies, we believe industry must bear the burden of co-financing expensive demonstration projects.

We hope that the Rand study is informative and useful to you. If you have any further questions, please contact Henry Sokolski of Senator Humphrey's staff at x48766 or George Tenet of Senator Heinz's staff.

Sincerely,

Gordon J. Humphrey.
John Heinz. ●

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[7] The full set of conditions is presented and the relationships between them modeled in K. A. Solomon, "Valuation of Nuclear Reactor Spent Fuel: Method, Application, Analysis," The Rand Corporation, R-2239-DOE, February 1978.

[8] See William E. Mooz, "Cost Analysis of Light Water Reactor Power Plants," The Rand Corporation, R-2304-DOE, June 1978; and "A Second Cost Analysis of Light Water Reactor Power Plants," R-2504-RC, December 1979.

[9] See B. W. Augenstein et al., "An Examination of Alternative Nuclear Breeding Methods," The Rand Corporation, R-1967-DOE, July 1978.

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PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, MONDAY, JUNE 13, 1983 No. 83

Senate

CLINCH RIVER: HERITAGE REJECTS FEDERAL SUPPORT OF ANY SORT

● Mr. HUMPHREY. Mr. President, I have argued on several occasions that the proposals for federally guaranteed alternative financing for the Clinch River breeder reactor project—the only private financing proposals for the project offered so far—simply make a bad thing worse. As the General Accounting Office (GAO) pointed out in a report that I entered into the RECORD, May 11, these schemes would actually add to Clinch River's cost. And the amounts here are not trivial. Indeed, according to GAO calculations, they could add several hundred million dollars to the project's cost. Nor should this be surprising. These proposals, after all, require that industry be given major tax breaks—lost revenue to the Federal treasury—and that Government pay industry an industrial rate of return for the money they invest in the project. As Shelby Brewer, DOE's Assistant Secretary for Nuclear Energy pointed out, these schemes are "simply moving money around in time."—they get industry to take Congress off the hook for having to fully fund Clinch River construction costs now by promising later to pay industry significantly more than industry ever loaned Government in the first place.

Of course, if we are truly intrested in seeing industry finance the project, no finer stimulus exists than to terminate Federal support. This is the position I have taken for the last 3 years and is the same position the Heritage Foundation emphazies in its latest Backgrounder entitled "Privatizing Federal Energy Research."

The foundation begins its report with a review of the lessons to be learned from past Government energy research efforts. Here the foundation emphasizes that commercialization projects make the least sense:

> There are a number of conclusions that can be drawn from the country's decade of experience with extensive government involvement in research, and these help to provide a framework for determining the proper federal role. The first is that the federal government should continue to have a limited, but important, presence in energy research, both as a patron of basic science, and as the sponsor of programs involving national security. . . . A second inescapable conclusion is that commercial demonstration projects will be far less likely to win congressional support in the future than they were in the 1970s. Congress has finally become aware of the inherent flaw in the logic underpinning federal encouragement of commercial demonstrations: That is, the notion that the law of supply and demand can somehow be repealed through legislative fiat, in order to force a new technology into the marketplace prematurely. Experience gained at great cost shows that this approach simply does not work. Despite the expediture of massive amounts of taxpayer dollars, little has been gained through commercial demonstrations.

The foundation's report, however, does not stop here. It gives a frame work for deciding which Federal projects should be terminated and gives precise examples:

> There are two methods that could be used to determine the appropriate roles for the government and private sectors. The first is on the basis of fuel type (fossil, nuclear, etc.), and the second is on the basis of research purpose (such as commercial demonstration, pilot-scale plant, or bench-scale test). Some blend of these approaches is likely to be necessary in each case. If this frame work is used, a number of obvious targets for privatization emerge . . . .
>
> All commercial demonstration project should be conducted by the private sector. Not only have these projects traditionally been undertaken by private organizations, but government commercial demonstration projects—dating from the attempt to create a synthetic rubber industry during the Second World War—have been singularly unsuccessful. Among the projects falling within this first category for privatization would be all of those undertaken by the Synthetic Fuels Corporation, together with the Clinch River Breeder Reactor and solar energy demonstration projects. . . . If these technologies are really commercial, the private sector should be willing to fund them.

The Heritage Foundation here gives us good advice. It is the same advice that the President's Private Sector Survey on Cost Control gave in April. Indeed, if we are truly interested in following the President's desire to get Government out of the energy commercial demonstration business, the place to begin is in terminating Federal support of any sort for the Clinch River project.●

Continuation of Senate Proceedings of July 13, 1983, Issue No. 97; and Proceedings of July 14, 1983, Issue No. 98.

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PROCEEDINGS AND DEBATES OF THE 98th CONGRESS, FIRST SESSION

Vol. 129 WASHINGTON, WEDNESDAY, JULY 13, 1983 *No. 97*

Senate

(Legislative day of Monday, July 11, 1983)

THE FINAL CLINCH FINANCING PLAN: WHOOPS, HERE WE GO AGAIN

● Mr. HUMPHREY. Mr. President, just a few weeks ago Congress decided not to fund the Clinch River breeder reactor project since no suitable industry cost-sharing plan had been submitted for congressional consideration. Now the people who authored the March 15 proposal that Congress rejected in May have submitted their final draft of this plan.

They claim this plan is new. They certainly have no desire to associate it with the bill proposed in May; even Secretary Hodel rejected it. Yet, on all basics, the current plan is identical. Thus, just like the bill proposed in May, the new plan offers no new contributions from industry beyond what they have already contracted with the Government to contribute. Instead of getting industry to reduce the cost of the project to the Federal Government, then, the BRC is still proposing that the Federal Government loan money to itself by issuing guaranteed bonds beginning in 1990. There may be difficulty selling these bonds in 1990 but that is not really the point: Such a money shuffle—what Assistant Secretary for Nuclear Energy Shelby Brewer himself described as moving money around in time—helps gloss over the controversy surrounding the project's high cost. Without such a scheme, Congress would have to appropriate over $400 million in fiscal year 1984 to keep the project on schedule. Also, to the strained extent that one can argue as the plan does that it raises $1 billion of private capital for the CRBR project—private only to the extent that private individuals might buy Government-guaranteed bonds if the interest rate is high enough—the plan could be conveniently misrepresented as a true cost-sharing plan where industry was giving new money to the project. This would have tremendous value for those who are anxious to believe anything in order to skirt the Clinch River cost issue.

In this regard, the plan also has the advantage that it requires Congress to vote up or down on nearly $1.5 billion obligations for the project—this to prevent any further floor votes on the project for at least the next 5 years.

Again, this is a feature of the earlier proposed bill.

But there is more. The previous proposal required the Federal Government to assume all responsibility for repaying bond and equity shareholders in the project principal plus interest and for providing the equity investors with a full array of guaranteed tax advantages. These guarantees are to be honored even if the project is not completed, is not licensed, does not operate as well as expected, costs much more to fuel than what the Department of Energy (DOE) optimistically assumes, produces electricity that cannot be sold for the high prices the BRC projects—11 cents per kilowatt hour—nearly 250 percent higher than current rates—or if the project ends up costing much more than the optimistic $4 billion projects. The new plan asks for no less.

The new plan's candor, though, does go a bit further. It admits, for example, that the nuclear utilities that originally pledged to pay for nearly one half of the project—but have only contributed $150 million so far—could not be expected even to buy equity shares or Government guaranteed bonds for the project since they had neither the means nor the inclination now to do so.

The plan also notes that "if net revenues available—from the sale of Clinch River electricity—after paying for fuel and other expenses are insufficient to provide returns on and of private investments in the project, the Federal Government will have to provide money for such purposes." This falls under the category of if at first you do not succeed ask the Government for money again. In fact, a failure of the proposed sale of bonds in 1990 to cover the costs of interim borrowing—the borrowing of $1.04 billion between 1984 and 1990 from private money markets to help pay for the project's construction—are quite real. Consider, the plans assumes that interim financing can be had on the private money market for 10 percent. Yet, who would loan money to the Government for the project at this rate if fully guaranteed Treasury bills could be brought bearing the same rate? As the former are riskier than the latter, higher interest would have to be paid. No matter, the plan's proponents might reply; we will simply sell more bonds beginning in 1990.

But what if these bonds do not sell as well as expected due to delays in the project? The answer cannot simply be that Government guarantees will take care of this since, again, the prospective bond buyer always has the alternative of buying fully safe, guaranteed bonds from the Treasury directly. This being so, not only will the Government have to sell more bonds to cover the interim financing, but these bonds will have to bear more interest than Treasury bills What is the significance of this? Simple: This so called cost sharing plan may only increase the cost of constructing Clinch River since it is the Treasury bill rate that Congress currently ends up paying when it appropriates for the project outright More important, there is no guarantee that the bonds will sell as well as they must. In this case, the Government ends up having to pay all of the interim financing costs, which exceed several hundred million dollars.

In light of the likely public bond disaster associated with the Washington Public Power Supply System (another public nuclear power project) all of this should sound familiar. Mr. President, because Congress can hardly afford to create the basis of a new bond disaster, I ask that the full text of the Breeder Reactor Corp's final alternative plan draft be entered into the RECORD.

The material follows:

BREEDER REACTOR CORP.,
Chicaog, Ill., June 29, 1983.

MR. WALLACE B. BEHNKE,
Chairman, Project Management Corp. Chicago, Ill.

Hon. DONALD PAUL HODEL,
The Secretary of Energy, Department of Energy, Washington, D.C.

GENTLEMEN: I am pleased to forward to you a Second Report of the Breeder Reactor Corporation Task Force which was assembled to explore alternative financing possibilities to supplement future Federal appropriations supporting the construction and operation of the Clinch River Breeder Reactor. The enclosed Report provides a detailed financing plan which the Task Force, including representatives from a number of utilities and investment banking firms, believes provides a viable basis for private sector supplemental financing.

The members of the Task Force and BRC stand ready to provide further information or to assist in the implementation of the proposed financing plan, as required.

Sincerely,

JAMES J. O'CONNOR,
Chairman.

HIGHLIGHTS

We have developed, and present herein, a specific plan for raising one billion dollars of private capital for the CRBR Project.

One billion dollars represents 40 percent of the estimated remaining cost to complete the Project. It represents the maximum amount of available private funds and is roughly equivalent to the entire cost of constructing a conventional coal-fired plant of approximatley the same size in the 1990's.

With appropriate legislation, we are confident that one billion dollars of private financing can be obtained.

Four leading investment banking firms (all represented on our task force) have endorsed the plan, providing a statement that, with adequate Federal assurances, significant private funding can be obtained for the Project.

We are implementing our financing plan to the maximum extent possible in advance of specific legislation by incorporating the Amerian Energy Development Corporation, a financing vehicle, preparing organizational and financing documents, and recruiting executive personnel.

Two-thirds of the private funds available for the Project will be raised through borrowings supported by revenues from future power sales; one-third will be raised through new equity participations plus funds already committed by the utility industry and others All new investments would be backed by DOE contracts.

Potential lenders will be institutions such as banks, insurance companies, pension funds and other financial institutions. Most of these institutions are fiduciaries which are held to strict accountability, frequently restricted in their discretion by statute or regulation and generally averse to high risk investments.

Hence the need for Federal assurances covering completion, licensing, operability and revenue adequacy, as described in the Appendix.

We have received letters from vendors and contractors expressing interest in investing in the Project.

Income attributable to private investment in the Project will be subject to Federal income tax. In computing the tax, conventional construction-related tax incentives will be available, but only to the extent available in other comparable private projects. No such incentives will be available with respect to any expenditures which are covered by Federal appropriations.

In general such incentives will reduce, but not eliminate, the total tax burden on investment income from the Project.

Non-tax aspects of the proposed financing arrangements will result in a significant potential gain to the U.S. Treasury.

After the Project has been completed and operated successfully for several years, it may be feasible, with the Government's permission, for the new American Energy Development Corporation to sell common shares and use the proceeds to purchase the CRBR facilities from the Government.

Since our financing plan will significantly reduce total Federal budgetary outlays at a time when budget requirements are of critical importance, and holds the prospect of net future gain to the Treasury, it is clearly responsive to the 1982 Congressional mandate.

Having taken preliminary steps toward putting our plan in effect, prompt enactment of appropriate legislation is now needed to enable us to raise the one billion dollars.

Financing Illustration

Sources of the one billion dollars of privately financed construction funds are estimated as follows:

	Millions
Proceeds of 30-year bonds issued in 1990	$1,040
Deduct interest during construction	365
Direct construction funds provided by borrowings	675
New equity participations	150
Funds already committed by utilities and others, including interest (in addition to about $150 million already paid in)	175
Total	1,000

Note.—For details, see section II-G.

Financing the Clinch River Breeder Reactor Project

(A Supplemental Task Force Report to the Breeder Reactor Corporation.)

EXECUTIVE SUMMARY

(1) A viable $1 billion plan. This supplemental report describes a specific plan for raising one billion dollars of private funds (the maximum available) to cover 40 percent of the estimated remaining costs to complete the Clinch River Breeder Reactor (CRBR) Project.

(2) Equivalent coal-fired capacity cost. The proposed private funding of one billion dollars is roughly equivalent to the entire cost of constructing a conventional coal fired plant of approximately the same size 300 to 400 MWe, in the 1990's.

(3) Reduced Federal deficits. These funds would be provided to the Federal governmental under a Joint Venture arrangement and would reduce the Federal budget deficit at a time when budgetary expenditures are of widespread concern.

(4) Investment banker endorsement. Four leading investment banking firms are represented on our task force. Their representatives have participated actively in our work and have helped develop our financing plan. Their firms have given us a signed statement saying, among other things, ". . . in the event [appropriate] legislation is enacted and the Secretary of Energy provides adequate assurances as to the timely return of invested capital with interest thereon, we believe that significant private funding can be raised for the CRBR Project." The four firms signing that statement were:

Lehman Brother Kuhn Loeb Incorporated, Merrill Lynch White Weld Capital Markets Group, Morgan Stanley & Co. Incorporated, and Salomon Brothers Inc.

(5) Need for Power. We have received letters from several large electric power systems (both investor-owned and rural electric cooperatives) indicating an interest in purchasing CRBR power. Studies made by the United States Department of Energy (DOE), supported by information received from the Southeastern Electric Reliability Council, show a need for power in the southeast in the early 1990's.

(6) Implementation. We are proceeding to take preliminary steps to implement our financing plan. We are incorporating the American Energy Development Corporation, a financing vehicle, and will soon select a Chief Executive Officer and Board of Directors. We are preparing organizational and financing documents.

(7) Two-thirds debt, one-third equity. Approximately two-thirds of the one billion dollars of private funds will be raised by interim construction borrowings in the capital markets, with the permanent financing provided by selling taxable bonds supported by revenues from power sales. The remaining one-third of the private funds will be raised through new equity participations, plus funds already committed by the utility industry and others. All new investments would be backed by DOE contracts.

(8) Institutional lenders. Potential lenders and largely institutions such as banks, insurance companies, pension funds, and other financial institutions. Most of these are fiduciaries which are held to strict accountability, frequently restricted in their discretion by statute or regulation, and generally averse to high risk investments. While they seek to maximize return, their first concern is preservation of principal. Their fiduciary responsibility prevents them from making an investment where repayment of principal and payment of interest is in substantial doubt.

These lenders will bear normal capital market risks, but in order to invest in the CRBR Project they will require Federal assurances covering completion, licensing, operability and revenue adequacy. This is particularly understandable in view of the Project's long history of political indecision and controversy which, together with other significant uncertainties about investments in public power projects, comprise unique project risks (as distinguished from capital market risks) for which the Federal government must continue to bear the responsibilities that it already carries. The nature of these assurances is set forth in the Appendix.

(9) Equity investors. Potential equity investors will require some participation in conventional Project-related tax benefits. On the other hand, all income attributable to private investment in the Project—both interest and equity return—will be subject to Federal income tax. In computing the Federal tax levied on private investment in the Project, only conventional construction-related tax incentives will be available, and only to the extent available in other comparable private projects. No such incentives will be available with respect to any expenditures which are funded by Federal appropriations.

(10) Tax Effect. Tax incentives reduce, but do not eliminate, the tax burden for taxpayers generally, and will do so here, too, to an extent no greater and no less than for taxpayers generally. Hence, there will be no net loss to the United Stats. This point is discussed in Section II-K.

(11) Long run effect on the U.S. Treasury. Over the life of the Project, there is likely to be a significant net gain to the Treasury, for a variety of non-tax reasons, including the system of incentives provided by our financing plan, viz.—

Construction costs: The advanced status of design, procurement, and preconstruction planning, and the existence of a strong projectwide schedule and cost control system, will minimize those construction delays and construction costs which are within the control of the equipment suppliers and construction contractors.

Adoption of our financing plan, coupled with a multi-year appropriation of Federal funds sufficient to complete the Project, will go one step further and ensure against many delays which are beyond the control of suppliers and erectors—e.g., delays from lack of funding and other Government action—thus, enabling the schedule and cost controls which are already in place to be fully implemented.

Future operations: Once the Project has been placed in service, the financing obligations contemplated by our plan will provide strong incentives to operate the Project in such a way that the debt service and other financial requirements will be met consistently. Project managers will be encouraged to improve commercial operations so as to avoid jeopardizing net revenues and, thus, being put on the spot for triggering the DOE's obligations to investors. This will enhance the possibility of providing significant residual values for the Treasury.

(12) Potential Gain. These benefits should far outweigh the nominal interest advantage which federal financing enjoys vis-a-vis private financing. In the long run, therefore, the task force plan has the potential of saving the United States Treasury a great deal of money.

(13) Other items. The CRBR Project is an experimental research and development project, an essential step in the Government's Liquid Metal Fast Breeder Reactor program, a long-range program to achieve a high degree of national energy independence in an environmentally acceptable way with minimal reliance on fossil fuel resources. The Federal government has the responsibility for and control of developing that technology and carrying through on the construction and completion of the CRBR Project.

Termination of the CRBR Project would be extremely costly, including not only the direct costs of over $300 million (estimated by DOE) for site restoration, termination of employees, cancellation of contracts and damages, but also the indirect costs to our national economy of taking one more step backward from the nuclear export markets which the United States once dominated.

We have received letters of interest from vendors and contractors expressing interest in investing in the Project.

Given the poor financial position of the U.S. electric power industry and the current rate regulatory climate, there is little likelihood that substantial additional R&D funds can be obtained from the nation's electric utility companies. However, these utilities and others, which will have paid about $150 million towards the cost of the Project by the end of Fiscal Year 1983, stand ready to pay about $175 million more, including interest, in accordance with prior commitments, as the Project goes forward.

After the Project has been completed and operated on a commercial basis for several years, additional risks may be assumed by private investors. For example, the newly-formed American Energy Development Corporation referred to earlier could, in the future, provide a mechanism for ultimately selling common shares and using the proceeds to purchase the facilities from DOE, if that were the Government's wish.

(14) Conclusion. The CRBR Project is well advanced in design, component procurement, site preparation, pre-construction planning, and licensing. We have identified and describe here a viable financing plan which will provide one billion dollars of private funds. Since our plan will significantly reduce total Federal budgetary outlays at a time when budget requirements are of critical importance and holds the prospect of net future gain to the Treasury, it is clearly responsive to the 1982 Congressional mandate ". . . to explore proposals . . . that would reduce Federal budget requirements for the Clinch River Project or project alternative, and secure greater participation from the private sector." (H.R. Rep. No. 97-980 at 186, 97th Cong., 2d Sess., 12/20/82.)

We are implementing the plan, to the maximum extent feasible pending enactment of appropriate legislation, and we therefore urge prompt action on such legislation.

I. GENERAL BACKGROUND

On March 12, 1983, a task force assembled by the Breeder Reactor Corporation submitted its report on alternative possibilities for obtaining additional private sector financing for the CRBR project to the United States Secretary of Energy, who transmitted it to the Congress on March 15, 1983. Comments made since then, in Congress and elsewhere, suggest the need for additional explanatory material.

This supplemental report provides such material. It describes the task force plan for private financing of one billion dollars of the remaining funds estimated to be needed to complete the CRBR Project, equivalent to about 40% of such remaining funds. It explains how that plan will complement the Federal government's role. It sets forth the assurances needed to facilitate raising the one billion dollars of private funds and explains the steps being taken to facilitate raising these funds as soon as those assurances are enacted into law.

A. Federal sponsorship

The Federal government must formulate its energy program from a long-term rather than a short-term perspective, because it is to the Federal government that the public will look to protect the interests of future generations. A cornerstone of federal energy policy through many Administrations has been the development of inexhaustible energy sources.

Nuclear technology, especially breeder technology, is the most likely source of future supplies of plentiful and low-cost electricity when fossil fuels become relatively scarce and expensive. It is not too soon to carry forward breeder technology to the demonstration stage. The completed design, licensing and, most importantly, extended operation of the CRBR Project over a long period, will be invaluable, first, as a basis for the design and operation of a larger prototype and, ultimately, for a decision whether or not to build and deploy commercial breeders. If the nation is to develop the information necessary to make commercial decisions on a timely basis early in the next century, the CRBR Project, the first full-scale demonstration plant, must be built now.

B. Historical summary

It was the Federal Government's recognition of its responsibility for assuring adequate and economical future energy supplies, including the technological capability to build breeder reactors, that convinced Government leaders to proceed with the CRBR Project as the logical next step in the Liquid Metal Fast Breeder Reactor Program. Early on, the Federal Government took the initiative in soliciting industry participation in funding the CRBR Project as an important step towards making this technology available to the private sector. The arrangements for Government support and industry participation were negotiated by the United States with representatives of all segments of the electric power industry. The Nation's electric power systems committed to make large financial contributions and they created Breeder Reactor Corporation and Project Management Corporation, in reliance on the Government's commitment to complete the CRBR Project. It would be unfortunate, both for the future of national energy security and for the future of government/industry cooperation in other areas. If the United States were now to retreat from its undertakings, after the utilities and others in good faith have spent $150 million on the CRBR Project and will provide an additional $175 million as the program goes forward. It is disappointing to see to what small extent current debates about funding the CRBR recognize the obligations the United States has already assumed and the expenditures it has induced others to make.

The current funding discussion provides a test of the resolve of the Government in living up to its promises. The United States created the financing and construction arrangements and enlisted the construction, operation and financial assistance of the electric utility industry. The coalition of utility companies has held together and is anxious to go forward to complete the CRBR Project, although it has no financial incentive, but only a desire to advance breeder technology for the ultimate good of the Nation. The partnership arrangements between the United States and the participating electric utilities should not be abandoned by unilateral action of the Government.

C. Need for CRBR project

Many voices have spoken on the question of the need for the CRBR Project, from various perspectives and with the benefit of more or less study and information. Last September, Alvin M. Weinberg, Director, Institute for Energy Analysis, Oak Ridge Associated Universities, a pioneer nuclear scientist, summarized the case for the CRBR Project in these terms, after a visit to the French Phenix and Super Phenix breeder reactor demonstration projects:

"Rather than dismantling our breeder technology, we should be consolidating the technology demonstrated by PHENIX and SUPER-PHENIX. Forty years pass quickly. If we are to depend on breeders for a serious contribution to our energy supply in 2022, we should even now be building, operating, and learning from many breeder reactors in different settings and in different parts of the world. This is why we should proceed with CRBR, as well as with other, even more advanced breeders."[1]

It should be added that the CRBR Project embodies state-of-the-art technology. The design team has taken advantage of all available information, including the lessons learned from the Brown's Ferry and Three Mile Island accidents. Proposals for substituting another project at a later date would not result in a better project. On the contrary, to abandon the CRBR Project at this time would dismantle not only the Project, but the nation's industrial capability to proceed with any breeder reactor demonstration program.

D. Cancellation consequences

The March 12 report of the task force discussed the costs of completion, but did not take onto account the costs, both financial and otherwise, of failure of completion. These cancellation costs—for equipment on order, for the cost of teminating employees, and for settlement of contacts for services and otherwise—are estimated by DOE at over $300 million. An orderly temination which would salvage as much technical information as possible could increase this amount significantly. Moreover, in a period of high unemployment, some consideration should also be given to the indirect costs of noncompletion, including the costs of increased unemployment and unemployment compensation. Finally, the cost to our national economy of the technological retreat inherent in abandoning the CRBR Project after spending a billion and a half dollars on it must be considered, especially when work is proceeding smoothly. To ignore these costs would be to take another long step toward ensuring the loss of our nuclear export markets, which we once dominated.

All of these costs of noncompletion, direct and indirect, should be considered as credits against the cost to complete the Project.

E. Task force proposal

Fundamentally, the task force proposal is based upon the assumption that this country cannot afford to fall behind the development of breeder technology overseas, which would result if the CRBR Project were cancelled. It is also based on the fact that no private interest is in a position to take up the financial burden of completing the Project. The proposal is therefore framed in terms of specific ways that private industry can cooperate with the United States to reduct the short-term burden on the Treasury and to make an overall contribution to long-term funding.

The task force realizes that the Government has many other claims on its resources. Many of them, however, do not plant the seeds of future growth and technological leadership. In contrast the CRBR Project holds out the prospect of a better future for all Americans.

Other countries have long recognized the need to develop breeder technology. Great Britain, France, and Russia already have breeder reactors installed in working power plants and are using them to generate significant quantities of electricity. Japan and Germany have their own breeder projects. The United States cannot afford to lag behind.

II. DESCRIPTION OF THE RECOMMENDED FINANCING PLAN

A. Joint venture

It is proposed that the entire CRBR Project, both the nuclear steam supply system and the balance-of-plant, be treated as a single entity organized as the CRBR Joint Venture, a joint venture between the Federal government and a partnership of private investors (the "Partnership").

The Government and the Partnership would each be participants in the Project, in proportion to their respective investments. Existing construction, licensing and operating responsibilities would not be changed.

B. Partnership.

The Partnership would provide the Joint Venture with funds raised in the capital markets, derived from both interim construction borrowings and the sale of long-term debt and equity securities, all backed by DOE contracts. It would also attempt to obtain funds from new sources—R&D contributions, vendor participations and foreign participations.

The Partnership, acting on behalf of the Joint Venture, would sell the Project's entire electric power output. Revenues from the sale would ultimately be pledged as security for long-term taxable bonds. Payment of interest and principal thereon would be made from such revenues, after deducting fuel and other expenses. Such payment would be protected, in the event of shortfalls, by DOE contract.

The Partnership would issue equity participations to the partners supported by tax incentives and, to a lesser degree, by such shares in excess power sales revenues and in the residual value of the Project as may be established by contract with the United States Department of Energy ("DOE"). The partners would be entitled only to those conventional investment tax credits and tax deductions for depreciation, R&D, and other costs which are normally provided to the owners of comparable private projects, but only to those credits and deductions which are attributable to Project expenditures paid for with private funds. The partners would be indemnified by DOE against the possible loss of such tax benefits.

C. Construction financing

To facilitate financing flexibility and provide construction funds when needed to optimize construction scheduling, interim construction financing commitments would be obtained from institutional lenders, subject to refunding with proceeds from the sale of long-term bonds upon completion of the Project.

D. Partnership responsibilities

The Partnership would enter into contracts with the DOE under which the Partnership would provide construction funds, dispose of the electric power output of the Project, pay for fuel, other expenses, debt service charges and other obligations to private investors. It would apportion excess revenues, tax incentives and residual values as provided by contract. It would also arrange for interim or supplemental borrowings, if required, and would take other appropriate actions to facilitate completion and operation of the Project and ensure its viability.

E. Formation of a new corporation

In order to facilitate the various financing, marketing and organizational steps required and help to carry out the responsibilities of the Partnership, a new privately-financed business corporation is being incorporated, the American Energy Development Corporation ("the Company"). Election of a Chief Executive Officer and a Board of Directors will occur soon.

It is expected that the Company will act on behalf of the Partnership in carrying out the activities referred to above, including development of financing arrangements, filing registration statements and requests for tax rulings, negotiating power supply contracts, and disposing of revenues therefrom.

F. Efficiency incentives

By its very nature, the financing plan will reduce construction costs, increase power sales and maximize operating efficiency, as described below.

Construction costs.—The advanced status of design, procurement, and preconstruction planning, and a strong project-wide schedule and cost control system will facilitate efficient fabrication, delivery and construction, and minimize those construction delays and expenditures which are within the control of the equipment suppliers and construction contractors. The fact that all long-lead-time equipment has already been delivered or is well advanced in fabrication lends assurance to the construction schedule and cost estimates. Adoption of the financing plan, coupled with a multi-year appropriation of the Federal funds needed to complete the Project, will go one step further and eliminate many delays which are beyond the control of suppliers and constructors, e.g. delays due to lack of funding or unexpected Government action—thus enabling those schedule and cost controls which are already in place to be fully implemented.

Future operations.—Once the Project has been placed in service, the very existence of significant debt and equity obligations to be paid from net revenues will provide Project managers with a strong incentive to maximize power sales and operate the Project in such a way that the obligations to investors will be met. To put it bluntly, under the financing plan, all departments and agencies will be discouraged from taking any action which could reduce output, jeopardize revenues, or unnecessarily raise operating expenses, because if net revenues available after paying for fuel and other expenses are insufficient to cover obligations to private investors in the Project, the Federal government will have to provide money for such purposes pursuant to the assurances it made to induce such investments, and management will be put on the spot to justify its actions.

Additional incentives.—While the plan will, by its nature, tend to reduce construction costs, increase production and improve operating efficiency, it is important that the terms of the contracts among the Company, the Partnership, the DOE and others provide a specific commitment by all parties, including the Government, to give highest priority to efficient construction and operation with a view to minimizing capital requirements, ensuring full coverage of all investment obligations including an adequate return to equity investors, and providing a significant payback to the United States Treasury. These contracts should set specific financial targets, e.g., that net revenues shall be sufficient to pay all expenses and debt services, plus an equity return and a specific residual value for the Treasury. Only by clearly setting forth such targets and providing for their periodic review can one enhance the likelihood that they will be attained.

The foregoing financial incentives (coupled with a multi-year appropriation) are of major significance. Without them, there will be constant temptation to change course—to delay appropriations, defer completion, vary construction and operating plans, interrupt output, and generally adopt practices which would increase costs and reduce revenues. In short, the financial incentives provided under the plan are expected to result in significantly higher net income and residual values for the Project, much of which will ultimately become available to the United States Treasury.

G. Revenues from power sales

A significant portion of the new private financing is expected to be obtained from the sale of long term taxable bonds, based upon revenues from power sales during the period from 1990 to 2020. These revenues are an important part of our financial plan.

While the DOE would provide contractual assurances as to revenue adequacy, the task force anticipates that, once the Project is completed, licensed and operating smoothly, the revenues available from power sales will be adequate to cover all operating expenses, debt service and other captial obligations, although some additional borrowings may be required during the start-up period and for several years thereafter to cover possible contingencies.

The task force's expectation that Project revenues will be adequate to support the financings set forth in the illustration in Section H, without drawing significantly upon Federal assurances, is based upon the following:

A total electric power output of two billion kilowatthours a year is assumed. This is based upon a capacity factor of 65 percent which appears attainable after a break-in period, given the operating incentives referred to earlier.

Gross revenues from power sales are estimated at 11 cents per kilowatthour. The 11 cents estimate is on the high side for the first few years of Project operation but is well below projected energy values for most of the Project's life. This is borne out by a survey of utilities in the southeast which was conducted for DOE by The S. M. Stoller Corporation. This survey indicated that average avoided energy costs alone (with no credits for avoided capacity costs), in the Southeastern Electric Reliability Council region, will exceed 11 cents per Kwh by 1997, while peak period energy costs (based on oil) will exceed 11 cents per Kwh in 1993. In either case, the amounts will become significantly higher after the year 2000. If credits for avoided capacity costs are added in, the estimates of avoided costs are in the 14 cents to 15 cents per Kwh range during the 1990's and over 20 cents per Kwh after 2000.

Fuel and other expenses are estimated at 5.5 cents per Kwh. This estimate is slightly lower than the DOE projections because we expect that the operating incentives referred to earlier will make a 5.5 cents per Kwh target readily attainable, if the Project is managed with an intent to obtain maximum output at lowest possible cost.

Subtracting 5.5 cents of expenses from 11.0 cents of gross revenues leaves 5.5 cents per Kwh available for debt service and other capital obligations. Applying this figure to the two billion Kwh of annual sales results in an estimate of $110 million of annual net revenues, which will support $1.04 billion of thirty-year debt, assuming interest at ten percent per annum. The assumed interest rate is below current levels, but is high by historical standards.

The $1.04 billion estimated proceeds from long-term debt financing is reflected in the illustrative tables shown in Section H, below.

The foregoing projections are dependent on several other assumptions, including those related to interest rates, capital markets, and taxes.

Whether or not credit for avoidance of new capacity additions can be reflected in future sales of CRBR Project power to ultimate consumers will depend upon the future rates of growth in electricity usage.

There is always a chance in dealing with a prototype project of this kind that the operating availability will prove to be lower than needed to attain the projected 65 percent capacity factor.

For all these reasons, Federal assurances as to revenue adequacy will be required. (See the Appendix).

Once the CRBR Project is operating smoothly, its costs will be relatively resistant to inflation, while the probable selling price of power will continue to rise.

After the Project has operated successfully for several years, revenues available from the sale of its power output are expected to exceed the carrying charges on its debt, particularly if oil prices rise or the need for new electric generating capacity materializes,[3] provided fuel and operating expenses are minimized and power output is maximized. Moreover, the opportunity to reflect credits for avoided capacity in the price of future power sales is an important factor of conservatism.

H. An Illustration of How The Financing Will Be Arranged

The following illustration sets forth the possible financing arrangements:

(a) The construction expenditure outlook after fiscal year 1983 (millions):	
Estimated cost to complete the project by 1990 (after fiscal year 1983)	$2,400
DOE's estimate of startup costs	100
	2,500
Funds availabe from outside private sources	1,000
Essential Federal appropriations	1,500
(b) Proposed financing plan (millions):	
Proceeds of 30-year, 10-percent bonds issued in 1990 (supported by $110 million of annual net revenues, see section (c) below)	[4] $1,040
Deduct interest during construction at an assumed 10-percent annual interest rate	[5] 365
Direct construction borrowings	675
New equity participations	[6] 150
Funds already committed by utilities and others, including interest (in addition to about $150 million already paid in)	175
Total private funds available	1,000
(c) Estimated sales and revenues supporting the revenue bonds:	
(i) Sales price per Kwh (cents)	11.0
(ii) Deduct fuel and other expenses per Kwh (cents)	5.5
(iii) Net per Kwh available for debt service ("i" minus "ii") (cents)	5.5
(iv) Annual Kwh sales in billions (assumes 350 MWe operating at a 65-percent capacity factor)	2
(v) Annual net revenues in millions available for debt service ("iii" x "iv")	$110

[4] While our estimates of revenues available to support $1,040 million of debt financing may be on the high side for the early years of project operations, they appear to be well within the zone of reasonableness over the entire project life. Nevertheless, additional working capital may have to be provided through supplemental borrowings to cover debt service and other needs during the shakedown period immediately after completion and for several years thereafter.

[5] Applying a 10 percent annual interest rate to construction fund borrowings, with interest figured to mid 1990, the scheduled completion date for the project.

[6] Supported in part by tax credits and deductions and, to a degree, by the prospect of participation in future excess revenues and residual values. The uncertainties and delays in realizing these tax incentives, excess revenues and residual values will limit their immediately realizable value to roughly 15 percent of total private financings of $1 billion.

I. Comments On The Partnership Approach

In the case of major project financings, conventional tax incentives significantly reduce the tax burden on the income flowing to private investors. That will be true here, too. With a lesser tax burden, the income from the sale of power which is required to provide the private investors with an adequate, after-tax return on their investments will be smaller than it would otherwise need to be.

The private capital used to finance a portion of the CRBR Project here, as elsewhere, should be entitled to the conventional tax incentives typically associated with that investment. These incentives would be measured by the entire private investment. Under the task force plan, the equity participants will receive all of these incentives, because they will receive a disproportionately small share of the Project income. Thus, the equity investment will be supported largely by tax incentives, rather than by Project revenues. The Partnership we propose is the legal conduit through which such tax incentives are typically channelled to equity participants for utilization against their non-project income.

It is estimated that $150 million of equity participation can be supported by these tax incentives coupled with some participation in future residual values (Section B, above). While this capital is equity in the sense that it represents ownership, only a small amount of it would be "risk capital" as that term is commonly used. Equity investors in this kind of project are, for the most part, anticipating specific tax consequences rather than the speculative profit normally associated with risk-taking. Hence, assurances as to the continuing availability of those tax incentives will be required.

The implications of the use of tax incentives as a financing device are discussed in Section K, below.

J. Residual Values

The economic value of the plant's output should increase over time as operating efficiencies are achieved and energy prices avance. For example, the service life may be longer or the revenues larger than needed to liquidate the debt and pay back the equity investors. The possibility of enhancing the Project's future economic value will be improved by the system of incentives described under Section E, above.

If future developments are favorable, the newly formed American Energy Development Corporation may provide the mechanism for selling common shares at some future time with the proceeds used toward the repayment of the Government's investment. The DOE contracts could, if the government so desired, incorporate a mechanism to achieve this objective.

K. Effect on the United States Treasury

Tax considerations. The conventional tax incentives associated with private investment in plant and equipment—the investment tax credit and deductions for depreciation, research and development and development and other costs—reduce, but do not eliminate, the tax burden on income from that investment. Measuring the degree of the reduction is complicated by the fact that the tax incentives become available in the early years of project life while the taxable income is reported over the entire project life, so that present value assumptions and computations are required.

Congress has recurrently examined the level of the incentives involved and, after increasing them substantially in 1981, cut them back in 1982 in order to ensure that the tax incentives do not outweigh the tax liabilities. Stated otherwise, 1981 increases in incentives were scaled back in 1982 in response to a specific concern that incentive levels had risen so high that, in some cases, they produced a "negative tax," in the sense that an investment would be less expensive if subject to tax than if wholly exempt from tax. In light of the 1982 legislation, it may be safely concluded in 1983 that, while incentives may greatly reduce the tax burden on such projects, Congress is satisfied that they do not cause the Treasury to "lose money."

It is true, as noted, that the tax incentives are distributed first and the associated tax liabilities are collected later, so that every new private investment causes Treasury tax revenues to be lower initially than they would be had no investment been made (and to be higher subsequently). Viewed alone, each new private investment thus tends to increase the budget deficit at the time it is made, but that is the deliberate consequence of the design of the incentives across the entire private sector and is outweighed by the positive effect on Treasury revenues of a higher level of investment than would otherwise exist.

However, even the initial negative budget effect would be absent in this particular case, as the tax incentives distributed at the outset are only a fraction of the appropriation that would be required from the Government over the same period, if the Project were to proceed without private financing.

No additional incentives are proposed in this case. Only the conventional tax incentives routinely available to all private investment are contemplated.

Nontax considerations. Rates of return on privately issued debt and equity will be higher than those which would be required on Federal debt. Private borrowing is always more costly than full Government financing since the Federal Government necessarily commands the lowest borrowing cost provided by the marketplace. The cost of financing, therefore, would be less were the Government to bear the full cost of the CRBR Project, as would be the case for any business financed 100 per cent by the Government rather than the private sector. That is the unavoidable consequence of seeking private investment in the Project.

Two aspects of this higher capital cost should be noted, however.

First, as in other investments, the financing costs will be covered by the prices paid by the private purchasers of the Project's output. Private financing costs are appropriate in such a case because these are the costs applicable to other privately purchased goods and services. (Financing at Government rates on the other hand, would be appropriate if there were no private purchaser and the Government were itself the user.)

Second, the discipline imposed by the necessity to operate within a profit context and to generate funds sufficient to cover the cost of private financing will produce other economies that should far outweigh the additional cost of private financing. Over the life of the Project, we expect that the United States Treasury will realize a significant net gain under the financing plan proposed here, due to the system of operating incentives described earlier which will minimize construction costs, maximize future revenues, improve operating efficiency over the Project's life, and thus, in all likelihood, provide significant residual values after the private investors have been paid off. These operating incentives which will be very substantial, are described in detail in Section F, above.

III. THE PURPOSE OF THE NEW FINANCING PLAN

A. The 1982 Congressional Mandate

In December 1982, Congress directed the Department of Energy ". . . to vigorously explore proposals . . . that would reduce Federal budget requirements for the Clinch River Project or project alternative, and secure greater participation from the private sector." (H.R. Rep., No. 97-980 at 186, 97th Cong., 2d Sess., 12/20/82).

The task force has devoted intensive study to alternative financing possibilities which would "reduce Federal budget requirements" and secure "greater participation from the private sector."

The task force plan envisages reducing Federal budget requirements by one billion dollars and raising that amount from the private sector. In our opinion, this is the maximum amount practically available therefrom. The securities sold would be backed by DOE contracts which would have no impact on either budget authority or outlays. The plan would also provide significantly long-term benefits to the United States Treasury.

We must stress two important considerations. One of them is that the private utilities and others, which will have paid about $150 million toward the costs of the project by the end of Fiscal Year 1983, will pay $175 million more, including interest, during the construction period, even though the financial condition of many of the utilities has deteriorated since the pledges were made.

Secondly, the CRBR Project is a part of a long range energy program the fruits of which will not ripen for several decades. The benefits of completion of the CRBR Project will be to advance the technology necessary to provide greater assurance of the long term availability to the nation of an adequate and economical energy supply, dependent only upon domestic resources. It is to the Federal government that the people of this nation must look for assurance that there will be adequate and economical energy supplies available in the future. It is only the Federal government that can afford the long look, which risks substantial amounts of seed capital for large, but distant, public benefits.

B. What The Plan Can And Cannot Do

Budget outlays. It is clear that the financing plan proposed will result in a significant reduction of Federal budgetary outlays at a time when budget deficits are of critical importance. Moreover, it can result in significant net benefits to the United States Treasury, for reasons set forth in Section II-K, above.

Risks. While the Project or its equity participants may be able to assume those plant operating risks which can be carried by commerically available insurance, the new plan cannot relieve the Federal government of the broad Project risks because, as a practical matter, responsibility for funding, constructing and licensing the Project and assuring revenue adequacy must remain in the Federal government for reasons set forth below.

C. Limitations on Private Investment

The uncertain history of the Clinch River Project forecloses it from general access to the private capital markets without the Federal assurances set forth in the Appendix. In addition, in today's environment, our system of state utility regulation prevents significant added participation by the nation's electric utilities. In this period, when electricity prices have a high profile and electricity price increases encounter great public resistance, utility commissioners are loath to authorize the recovery of contributions to demonstrate advanced technologies which will not provide benefits to ratepayers until several decades hence. Moreover, the utilities themselves cannot afford to support such efforts at stockholder expense.

D. Some Observations On Investment Risk

Availability of risk capital. The amount of private investment capital available for a given project varies inversely with the perceived risk. Maximum funds are available for investments thought to have the least risk of non-repayment, such as securities of the United States Treasury, while relatively little money is available for ventures of high risk. In fact, these cease to be "investments" and become "speculations" appealing to a limited class of high risk takers. While the market provides substantial risk capital for speculative ventures, most of such venture capital is available only for high technology and other enterprises at the frontiers of development, and on terms which provide investors with an equity stake in a potentially promising future. No venture capital is available for investments perceived to involve high risk, modest return, and small opportunity for speculative gain.

As a long-term national research and development effort, the CRBR Project does not offer such an equity stake or the possibility of significant speculative gains to investors.

Additional financing sources. It seems clear, therefore, that no significant amounts of "risk capital" will be available to the CRBR Project. Instead, whatever private market funding is provided for the Project will be in the nature of "project financing" in that the credit therefor will be derived wholly from the Project assets and revenues and from agreements and warranties associated with those assets and revenues. This is to be distinguished from conventional financing where a credit-worthy going concern, such as a large industrial corporation or utility, raises funds on its general credit for investment in particular assets or activities.

The major market for such long-term project financing lies with institutional investors such as insurance companies, pension funds, banks and other institutions. Most of these institutions are fiduciaries which are held to strict accountability, frequently restricted in their discretion by statute or regulation, and averse to high risk investments. While they seek to maximize return, their first concern is preservation of principal. Their fiduciary responsibility will prevent them from making an investment where repayment of principal and payment of interest is in substantial doubt. There is a lesser market among individuals who make fixed return investments.

In the United States, investors are under no compulsion to accept a security which does not fulfill their investment objectives. An offering must attract their participation in competition with a vast array of alternative investments in which the yield varies in relation to the perceived degree of risk.

Capital market risks. Long-term fixed income securities such as we are proposing be issued are vulnerable to erosion in value because inflation or currency devaluation reduces the real value of all dollar denominated investments. Long-term investors in this country have borne the risk of inflation during recent years and have suffered severe consequences. They have also borne the related risk of changing interest rate levels and have suffered accordingly as the value of their fixed-return investments declined because, in making long-term commitments, such investors forego the opportunity to make more attractive investments which may come along, and, if they wish to sell, they must do so at a heavy loss of principal.

These are all capital market risks, which are wholly apart from the project risks. These are the risks which the proposed financing plan places on investors.

Project risks. On the other hand, there are certain investment risks which are inextricably tied to the CRBR Project. When the regulatory and other risks associated today with all nuclear investments are considered, plus the fact that the CRBR Project involves an experimental type of reactor with a commercial pay-back deferred far into the future, and that it has suffered from a long history of political indecision and controversy, it must be concluded that no significant amount of private investment will be obtainable unless the project risks (as distinguished from capital risks) are eliminated. Such risks may be defined as risks that the Project will not be completed and operated as planned and will not produce the funds required to meet the Project's capital obligations. Only the Federal government has both sufficient credit and a sufficient public responsibility to support this basic research and demonstration Project and assume these project risks.

It is for these reasons that the task force believes the credit assurances set forth in the Appendix are necessary to conform project risks to those applicable to conventional investments. These assurances will not be called upon unless specified contingencies occur; accordingly, they are not subsidies.

In our judgment, securities backed by DOE contracts would be readily marketable in the private sector for the amounts required and without any budgetary impact.

IV. CONCLUSION

Congress has asked for a plan to provide private sector funding for a significant portion of the CRBR Project, as an alternative to funding the entire Project through direct Congressional appropriations and hence increasing already large budget deficits.

The task force has submitted such a plan and is taking steps to implement the plan to the fullest extent possible prior to enactment of enabling legislation. These steps include incorporating the American Energy Development Corporation for purposes described earlier, recruiting executive personnel, preparing Partnership organization and financing documents, and obtaining letters of interest from potential power purchasers, investors and investment bankers.

We therefore urge that the legislation needed to permit our proposals to be fully implemented be adopted promptly.

Respectfully submitted.

The BRC Task Force,
By Gordon R. Corey,
Chairman.

Task Force Members:
John W. Barr,
Principal, Morgan Stanley & Co. Inc.
George B. Campbell,
Financial Vice President, the Southern Co.
William H. Grigg,
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Capital Markets Group.
Jerome S. Katzin,
Managing Director, Lehman Bros. Kuhn Loeb, Inc.
Edwin A. Lupberger,
Senior Vice President,
Chief Financial Officer,
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R. Todd Vieregg,
Sidley & Austin.

June 23, 1983.

APPENDIX: FEDERAL ASSURANCES REQUIRED

The following assurances must generally be provided incontestably:

1. Assurances as to completion, licensability and operability—Governmental contracts to provide sufficient funds to repay all construction loans, private equity and other investments in the Project if it is not completed satisfactorily, fully licensed and placed in commercial operation in a timely fashion, in which case the investors would be entitled to recover their capital plus interest or a return thereon.

2. Assurances that all debt service obligations of the Project as well as its obligations to equity investors will be met under any and all circumstances—Governmental contracts to provide sufficient funds to cover all obligations to private investors plus all construction and operating costs, taxes and other claims, with respect to the CRBR Project, and to receive a protion of the proceeds from the sale of the power and any other revenues from the CRBR Project up to the amount of such funds, whether or not there are any such other revenues or power.

3. Assurances that all tax credits, deductions and other tax incentives, related to the privately-financed portion of the Project, will be available to the private investors as planned—Governmental contracts to provide sufficient funds to make appropriate repayments to private equity investors if tax incentives are not made available as planned.

4. Assurances against liabilities for replacement power costs and all uninsurable tort liabilities, resulting from the CRBR Project—Governmental contracts to provide such assurances. ●

[illegible] "Plant Energy Management," September 1982.

[illegible] The Southeastern Electric Reliability Council has stated in a letter to Project Management Corporation dated May 20, 1983 that their update of a previous study ". . . shows that there is indeed a more than sufficient market for firm power (capacity and energy) in the amounts designed for the Clinch River Breeder Reactor for the years 1992 and subsequently."

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Senate

THE CLINCH RIVER FINANCING PLAN: NOTHING TO SHARE

● Mr. HUMPHREY. Mr. President, recently Secretary of Energy Donald Hodel announced that he would ask Congress to make the Breeder Reactor Corporation's (BRC's) final off-budget funding proposal for the Clinch River breeder reactor project law before the end of this fiscal year. This announcement came in answer to Congress recent passage of the energy and water development appropriation for fiscal year 1984, which prohibits further funding for Clinch River until substantial industry cost-sharing is enacted.

Unfortunately, the proposal Hodel has agreed to back is no better than the plan he refused to submit to Congress 3 months ago in May. The reason why is simple: The plan he has been asked to back now is based on the earlier plan and has the same fundamental flaws. It still does not answer Congress request for industry cost sharing because it does not place any industry investment capital at risk. It still requires interim private borrowing and is virtually certain to increase the cost of paying for the project over continuing to fund it through congressional appropriations. Finally, it still depends entirely on Government guaranteed issues and Government guaranteed tax benefits.

Mr. President, it is important that whatever Congress does to defuse the Clinch River breeder reactor controversy, it not end up making matters worse. My own staff has had a chance to analyze the proposal Secretary Hodel has agreed to back. I ask that the full text of this analysis and a dear colleague letter that Senator Bumpers and I recently distributed on the BRC proposal's flaws be entered into the Record.

The material follows:

U.S. Senate,
Washington, D.C., July 28, 1983.

Dear Colleague: On July 21, 1983, Secretary of Energy Donald Hodel announced that he would ask Congress to make the Breeder Reactor Corporation's (BRC's) final off-budget funding proposal for the Clinch River Breeder Reactor Project law before the end of this fiscal year. This proposal (attached) appears to be fundamentally unsound and to fail the requirement of fiscal year 1984's Energy and Water Development Appropriation that there be substantial industry cost-sharing before the project is allowed to proceed.

Our reasons for questioning the BRC's final proposal are detailed in the attached stafff analysis and center on the following points:

1. Federal support and establishment of the BRC's proposed American Energy Development Corporation sets a dangerous precedent. The federally supported corporation could equally well be used to conceal funding for Clinch River's fuel cycle support activities—$3 billion worth of line items normally funded separately from the project. In fact, the project's proponents attempted to establish such off-budget funding for Clinch River last fall when it was suggested that an off-budget nuclear fuel cycle activities account be created within the nuclear energy budget.

2. The plan is not an industry cost-sharing proposal because no industry funds are placed at risk. Indeed, industry itself publicly admits this. Instead of true cost-sharing, which would reduce federal expenditures through increased industry contributions to the project, the plan would merely take a portion of the project's funding off the annual federal budget by having the government lend money to itself through the sale of government-guaranteed bonds. This cosmetic move in no way reduces federal spending on the project. More important, because the plan requires interim private borrowing before the government-guaranteed bonds are sold, it will actually increase the cost of financing the project as compared to continued federal appropriations.

3. The BRC task force and financial houses that the Department of Energy paid nearly $1 million to produce this proposal did not follow Congressional instructions to reconsider the original cost-sharing proposal of 1971, which had the nuclear industry pay for nearly one-half of the project's costs. Also, the task force failed to consider the aggressive cost-sharing plans now in place in Germany, France and Japan for their breeder industrialization development efforts, even though the task force was instructed to do a "vigorous" exploration of alternative cost-sharing proposals.

As the attached staff analysis, "The Alternative Financing Plan for Clinch: Nothing to Share," makes clear, the BRC's plan is far less than it claims to be. The plan should be carefully reviewed by the appropriate authorizing and appropriating committees and should proceed as normal legislation. In no event should the Senate resort to any last-minute legislative procedures.

With warmest regards, we are

Sincerely,

Gordon J. Humphrey,
U.S. Senator.
Dale Bumpers,
U.S. Senator.

The Alternative Financing Plan for Clinch: Nothing to Share

BACKGROUND

Shortly after the Clinch River Breeder Reactor project was first authorized in 1971 at a cost of $400 million, an agreement was reached among the nation's electric utilities, the Breeder Reactor Corporation (the BRC, which acts on the utility industry's behalf on the Clinch River project), and the Atomic Energy Commission that the utilities would contribute $257 million (and whatever interest this amount might earn) to defray the project's construction costs. In exchange, the utilities would be able to get in on the ground floor of breeder technology, which they assumed they would require by the early 1980s to meet what turned out to be unrealistically high electricity demand projections. This 50 percent contribution did not entitle the utilities to any equity share or ownership in the project. The project itself was to be built on federal TVA property and TVA secured an option to buy the plant if the government chose to sell. In 1972 the AEC increased the project's estimated construction costs to $700 million and the utilities demanded that their contribution pledge by frozen at $275 million plus interest.

Unfortunately, the project's estimated cost continued to rise. The Department of Energy (DOE) now admits that the reactor's construction will cost at least $4 billion. Last December after funding for the project was defeated in the House and carried in the Senate by only one vote, Congress instructed DOE to "vigorously explore proposals, including a reconsideration of the original cost-sharing arrangement [the 50 percent contribution arrangement], that would reduce Federal budget requirements for the Clinch River Project." DOE was to report its findings by March 15, 1983.

DOE divided its study. It supplied technical information to the BRC, which in turn submitted general suggestions for developing private financing for Clinch River to DOE on March 12, 1983. The BRC's general suggestion was that government surrender its claim to any of the revenues that might be made from the sale of electricity from Clinch River and use this revenue stream as the basis for issuing government guaranteed bonds that, in turn, could be used to spread out spending on the project.

The Congressional reception to this March suggestion was cool. The critique by the General Accounting Office was negative. GAO observed that "while the proposal will probably change many of the existing project arrangements" (such as the government's right to own and sell the plant and to take the revenues from electricity sales or impute them into the possible sale price it might ask for the plant), "the Federal government still appears to retain most risks if the project fails or if cost overrruns occur." In this case, the new bond holders would get their money back plus interest, plus tax benefits no matter what and would be responsible for none of the new costs or risks. The GAO also pointed out that industry would be able to claim over $400 million worth of tax credits (depreciation, accelerated depreciation, investment tax credits, and research and development tax credits) by participating in the plan even though industry would only be lending the government $800 million.

A possible bill to enact this proposal was drafted by DOE in late April. This bill was nearly introduced in May but Congressmen Bevil and Fuqua objected to the proposal because it failed to reduce the cost of the project to the federal government. After consulting these Congressmen, top officials at DOE decided not to submit the bill (see *Energy Daily*, May 10, 1983).

THE PLAN

Work to finalize the BRC draft proposal continued. On June 23, the BRC task force submitted a second report to Secretary of Energy Hodel. The task force claimed in this final draft that it had developed "a specific plan for raising one billion dollars of private capital for the CRBR project" and "one billion dollars represents 40 percent of the estimated remaining cost to complete the Project (2.4 billion dollars)." In its basics, this plan is identical to BRC's earlier proposals. This plan's elements are as follows:

1. Congressional obligation to be voted on in one up-or-down vote in 1983 and to be spent over the next seven or more years to construct the project (this would effectively remove Clinch River as an issue from Congress for several years)—$1.400 million.

2. Utility contributions already pledged ($257 million) plus interest (approximately $68 million) minus what the utilities have contributed to date ($150 million)—$175 million.

3.- Equity shares in the project that a newly created corporation (The American Energy Development Corporation) would begin selling immediately $150 million.

4. $1.04 billion in proceeds from the sale of 30-year 10 percent bonds (to be issued beginning in 1990) minus the interest costs of borrowing an identical amount at 10 percent from private sources to pay for a portion of the project's construction from 1984 through 1990 before the bonds are issued ($365 million)—$675 million.

Total funds raised off budget—($1. billion) plus Congressional obligation—($1.4 billion) equals what DOE estimates it will cost to complete the balance of the project—$2.4 billion.

The first three elements of the plan (the numbered items 1 through 3 above) are fairly straight forward The plan (1.) would require Congress to commit itself to a multi-year obligation to spend $1.4 billion over the next seven or more years to complete the project's construction. The plan (2.) assumes the nuclear utility industry will make good on its existing pledge to contribute $257 million plus interest (i.e. that after subtracting the $150 million already contributed, the nuclear industry will contribute another $175 million over the next 5 to 7 years). The plan (3.) would create a new entity, the American Energy Development Corporation, that would immediately sell $150 million worth of equity shares in the Clinch River project. These equity shares would entitle their holders to any profits that might be made from the sale of Clinch River electricity (the federal government would surrender its existing claim to the project's electricity sale revenues to the new corporation), and certain tax benefits.

These first three elements would account for $1.725 billion of the $2.4 billion DOE estimates it needs to complete the remainder of the project; and subtracting the Congressional obligation of $1.4 billion, the off budget elements would account for only $325 million). The balance ($675 million) necessary to bring the private sector funding up to $1 billion and the total funding up to $2.4 would be raised by the plan's fourth element—through the sale beginning in 1990 of 30-year, 10 percent bonds.

The proceeds from these bond sales, $1.04 billion, according to the plan, is precisely the amount of money needed to pay the principal and interest on $675 million (this assuming the money would be needed in equal amounts annually between 1984 and 1990 before the bonds were issued to help pay for the project's construction costs and that money could be had from private lenders at 10-percent).

Private lenders presumably would lend the project the $675 million at a cost of $365 million (the compounded 10-percent interest charge on $675 million for the interim period 1984-1990 described) on the expectation that beginning in 1990 $1.04 billion worth of 10-percent bonds would be issued to pay the private lenders back. The Congressional obligation to spend $1.4 billion to complete construction of the project through 1990 would also serve as an assurance that the project and repayment were sound prospects.

In presenting this plan, BRC claims that it has "vigorously explored proposals . . . that would reduce Federal budget requirements for the Clinch River Project." The BRC, though, carefully avoided reference to the complete Congressional instructions, which specifically asked DOE to "include[e] a reconsideration of the original cost sharing arrangement." This original cost sharing arrangement required the nuclear industry to pay for nearly 50 percent of the project's estimated cost and entitled the industry to no equity share or ownership in the plant. The reason why BRC deleted reference to this original instruction is simple. Properly understood, their proposal has nothing to do with the original 50/50 cost sharing arrangement or cost sharing which would place the nuclear utility industry's money at risk. Thus

1. No new nuclear industry contributions are provided for by the Plan. In some press accounts the BRC proposal is portrayed as providing an additional $175 million in contributions from the utilities but this, in fact, is the precise amount the utilities already owe the project from their original pledge of $257 million plus interest. This pledge was made by the utilities in a contract with the BRC and the federal government. Given this contract, the utilities would have to pay this $175 million or go to court to get out of their contractual pledge. This would be the case with or without the plan.

2. The plan requires complete government guarantees to industry against all possible risks or losses. Thus, the plan explicitly states that the federal government must guarantee the principal, tax benefits, and a fixed rate of return on the bonds and the tax benefits on the equity shares if the nuclear industry is to participate. The BRC correctly notes that the nuclear utilities currently have neither the money nor the regulatory backing to participate in further support of the project beyond fulfilling their original pledge of $257 million plus interest (even this pledge, it should be noted, is uncertain since only $150 million has been raised so far and the last contribution the nuclear industry made was in very early 1977—over six years ago). What is even more disturbing is the prospect that many state public utility commissions may not allow their utilities to participate in the plan even if the federal government does provide guarantees. As the National Association of Regulatory Utility Commissioners pointed out June 13, 1983 (See The Congressional Record, "Alternative Financing for Clinch River—Utility Regulators Unenthusiastic," June 16, 1983), "Many regulatory agencies, by state law or regulatory precedent, either limit or do not allow utilities under their jurisdiction to recover from current ratepayers the cost of plants held for future use or construction work in progress. Some of these same jurisdictions are facing the issue of how to cope with the current and future costs of existing excess capacity and abandonment or termination of power projects that will still be a problem at the projected in-service date of the breeder reactor. To ask the nation's utilities (and ultimately the ratepayers) to invest an additional $800 million in the project during this period of financial uncertainty seems harsh In addition, while it has been suggested that the Federal Government offer enhanced tax benefits to utilities for financing the project, the fact is that the nation's utility customers already carry a heavy load through rates for deferred income taxes and investment credits." Whether or not utilities can get the government to guarantee a fixed rate of return on investment on the bonds or a high level of tax advantages on the equity shares, then, may be irrelevant to the prospect of them investing: They are already having a difficult time paying for their own construction projects and until these are paid for, their public utility commissions are unlikely to let them spend money anywhere else. What the task force must assume (although they do not admit it openly) is that the government guarantees will make the equity shares and long-term bonds look so attractive that the nuclear utilities (the supposed benefactors of the project) will not have to be relied upon to invest in these issues; that others will buy.

3. Most, if not all, of the plan's $150 million in so-called equity shares would be paid for out of the U.S. Treasury, not from the nuclear industry's existing pool of venture capital. One of the key objections to the BRC's earlier alternative financing formulations of March was under them the federal government would be extending hundreds of millions of dollars of tax benefits to secure industry's participation. Thus, in the case DOE itself used to test out BRC's early formulations, the investment tax credits, depreciation, and accelerated depreciation that industry could take on a loan of $763 million to the project would cause a tax revenue loss, according to the GAO, of over $400 million to the U.S. Treasury. Such tax benefits have not been eliminated in the latest final version of the BRC's plan. Unlike the early March formulations, the final plan would not allow depreciation and accelerated depreciation credits on the bonds that would issued beginning in 1990. But it still permits industry to take a tax investment credit of approximately 10 percent on these bonds, which, assuming industry bought all $1.04 billion of the issues, would be worth over $100 million. The plan also allows depreciation, accelerated depreciation, tax investment credits, and research and development tax credits to be taken on the $150 million worth of equity shares. GAO officials estimate that the later equity share tax benefits could exceed $75 million in value to the industry. Thus, the government guaranteed tax benefits associated with the bond and equity shares could more than repay the industry for the $150 million it might invest in so-called equity shares. Confirming these points, Miner Warner, Salomon Brothers vice president and Commonwealth Edison chairman James O'Conner conceeded in questioning before the press July 21, 1983 (see Energy Daily July 22, 1983) that industry's equity contribution would come from the tax benefits available to the investors, not from risk venture capital. In way of an explanation, O'Conner claimed that he had high confidence that the project would be built and run successfully, but that it was unfair to ask private companies to assume any of the risks associated with the project.

4. The nuclear industry assumes no responsibility for project failures, delays, or cost overruns. In fact, the plan emphasizes that the government must guarantee all tax benefits, interest, and principal on the bonds. These guarantees are to prevail no matter if the project costs more than expected or is not built, if the project fails to perform as well as projected, or if electricity from the plant does not command as high a price as DOE optimistically projects. As for the equity shares, which will be paid for by industry from the tax advantages they gain from investing in the project, these too, as noted above, are to come with their own government guaranteed tax benefits. Given the nuclear industry's repeated insistence that there will be no further cost overruns on the project (that the past overruns were simply due to Congressional delays), one might think that this plan might at the very least eliminate further requests of Congress for money. Yet, when asked (again see Energy Daily, July 22, 1983), the authors of the plan refused to make a commitment that the private participants in the project would not come back to the government for more support should the project turn out to cost more than planned or encounter expensive operation and maintenance problems. More important, the plan itself stipulates that if Clinch River revenues for any reason fall short of the amounts necessary to pay off the investors, the government must pick up the difference.

5. Ironically, the plan increases the federal government's risk exposure and is almost certain to increase the project's cost. As noted above, the government must guarantee tax benefits and full repayment of the bonds even though the project's true final cost is uncertain as is its performance level. More important, though, is that the plan assumes that the interim financing will only cost 10 percent or what it currently costs the government to borrow through the U.S. Treasury to fund federal projects and programs. Even with government assurances, though, the uncertainty inherent to the project is such that this interim financing is almost certain to cost more than Treasury issues. Finally, the plan assumes that the project bonds issued in 1990 will also sell for the same rate as Treasury issues. This again seems unreasonable since even if the bonds are heavily guaranteed, they must carry some risk premium over Treasury issues. Otherwise, the buyer would reason, there would be no reason for the bonds to be issued separately from Treasury issues in the first place. Here it is instructive to note that if the bonds sell for only 1 percentage point more than Treasury bonds, they would add nearly $100 million to the project's financing costs over what the cost would be if Congress simply continued appropriating money for the project as it has in the past. The only possible way around this difficulty would be to have the Federal Financing Bank issue the bonds (a step that would require the review of the Finance Committee). Nothing in the plan, however, can assure against the need for additional funding to cover project construction and operation overruns or less than expected revenues from electricity sales. As the plan notes, "if net revenues available after paying for fuel and other expenses are insufficient to provide returns on and of private investments in the Project, the Federal government will have to provide money for such purposes."

6. The plan's ability merely to breakeven depends on electricity sales from the reactor, which are almost certain to prove insufficient. Indeed, the plausibility of even attempting this "movement of money around in time" (the phrase of Shelby Brewer, Assistant Secretary of Nuclear Energy) rests on the mistaken assumption that utilities in the region of Oak Ridge actually will need the electricity Clinch River will produce. The plan's authors are rather vague about who will buy Clinch River's electricity. Several utilities have allowed that they might buy some electricity from the plant at avoidance costs (at prices at or below their cheapest alternative source), but no utility has yet been willing to sign binding contracts for purchase of the electricity even under these favorable conditions, much less at fixed market rates. The reason for such reluctance was best explained recently by TVA's general manager, William Willis. As he explained in testimony before the Environment and Public Works Subcommittee on Regional and Community Development in April, ". . . we do not anticipate having any need for capacity in that time frame" (through the year 2000). Confirming his point are not only the TVA's own regional demand projections, but two major, recent Congressional Research Service studies (See Alvin Kaufman and Karen K. Nelson, "Do We Really Need All Those Electric Plants?", CRS Report No. 82-147 S, August 1982 and Office of Senior Sepcialists and the Science Policy Research Division, "Perspective On Regional Electric Utility Planning"—working title of CRS report to be issued July 31, 1983). Their conclusion: Even assuming high demand, electricity capacity for the regions within reach of Clinch River will be overbuilt through the 1990s. Perhaps in recognition of this, Gordon Corey, chairman of the BRC task force that authored the plan, privately volunteered that Clinch River electricity might best be sold to distant Florida—a prospect even DOE rejected in its March 1983 analysis since extensive new, efficient power lines would have to be paid for, built, and integrated into Florida's power grid merely to dispose of the generation capacity of a plant that at most will be equivalent to that of a small coal plant.

7. The plan is an embarrassment when compared against the original cost-sharing agreement and other nations' commercial breeder development cost sharing efforts. Assuming that industry completes its own pledge to contribute $257 plus interest, or approximately $350 million, it will have assumed less than 9 percent of the $4 billion

DOE optimistically assumes the project's construction will finally cost. The so-called equity shares would increase the total to at most no more than 12 percent—a far cry from the 50 percent contribution required by the original cost-sharing arrangement, which allowed industry no equity share or ownership in the plant. The plan also compares unfavorably with foreign cost sharing arrangemnts. Germany, for example, requires private indstry to pay for, (not lend government) 29 percent of the commercial breeder effort in that country. Germany's other advanced nuclear energy commercialization effort—a high temperature gas cooled thorium fueled reactor—is cost shared not only with industry, but with money from the state or locality where the work is being done on the reactor (such state cost sharing pays for 9 percent of the project). The French, meanwhile, pay for their industrialization development breeder—the Super Phenix—entirely through increased utility rates and foreign participation. Thus, absolutely no French national research and development money is involved in this effort. Instead, 51 percent of the plant's cost is paid out of increased French utility rates, 30 percent comes from Italian utility cooperation, and 19 percent comes from Dutch, German, and Belgian utility cooperation. Finally, Japan—a heavily corporatist state—requires private industry to pay for (again, not lend) at least 20 percent of the cost of Japan's commercial breeder effort.

CONCLUSION

Recently, Secretary Hodel spoke before the staff of the Washington Times and Nucleonics Week and emphasized that although it was important to maintain America's lead in breeder reactor research, building Clinch River or any other breeder demonstration plant in the near-term was not necessary to accomplish this and that maintaining our base breeder research program (currently funded at more than $300 million for fiscal year 1984) was sufficient to the task (See Los Angeles Times, June 27, 1983 and Nucleonics Week, June 30, 1983). Apparently industry agrees, since it no longer thinks they should share the project's costs by increasing their share of contributions. Nor do they think they ought to assume any of the project's risks.

As for the work of DOE and BRC task force, little that is favorable can be said. Congress gave DOE $1 million to produce increased industry cost sharing. Yet, neither DOE nor the BRC or the financial houses who were paid to participate seem to have worked all that vigorously to do so. Although instructed to do so, they did not seriously reconsider the original 50/50 cost sharing arrangement nor is there any evidence that other options such as foreign cost sharing, national utility taxes, or state cost sharing were examined in depth.

That Congress asked for increased private cost sharing on the project and only received a proposal for government to lend money to itself at increased risk is disappointing. The bigger point, though, is that this disappointment ought not to be all that surprising. For several years now the shortcomings of the Clinch River Breeder Reactor Project have been documented in great detail. A project that is difficult to justify economically generally is difficult to cost share with industry. Industry, unlike government, after all, needs to show a profit to survive. Although the nuclear industry was vitally interested in investing in Clinch River when it seemed that it would produce significant commercial benefits, it no longer is willing to put new capital at risk.

Under these conditions, proponents of the project find it easy to conclude that government should simply assume industry's share (thus, the hollowness of the plan they offer). They would have Congress ask how can we finance Clinch River? Yet, the difficulty the proponents are having in getting industry to pay for more of this "industrialization" project (the term DOE uses in its latest budget justification for Clinch River) suggests that this is the wrong question. If Congress is unwilling to pay for all of the Clinch River Project because it is too costly and open to question, and industry is unwilling to put any more of its capital at risk, the question no longer is how can government cost share the project, but rather whether or not government should at all.

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CLINCH RIVER AND THE PLAN—WHAT THE PROPONENTS AND PRESS SAY

● **Mr. HUMPHREY.** Mr. President, I have long opposed further Federal support of the Clinch River breeder reactor project. As I have noted on numerous occasions, the project is unnecessary to keep the United States ahead in breeder research and development. Indeed, even the Department of Energy (DOE) refuses to call the project a research and development effort in its budget justification. DOE calls it an industrialization project. And with good cause, Clinch River is simply the demonstration of a specific breeder design first drafted back in the middle 1960's. It is to breeder research and development what the Concorde is to supersonic air transport design research test beds—a commercial execution of a fixed design rather than pilot-scale work to generate data necessary to develop an advanced designs. The later pilot scale work is what truly matters. And DOE recognizes this: It always has had a separate breeder research and development program, known as the base breeder program and it now is funded at over $300 million.

Indeed, recently Secretary of Energy Hodel confirmed each of these points in separate interviews with the staff of the Washington Times and Nucleonics Week. In both interviews, which were reported nationally over United Press International's news service, Secretary Hodel emphasized that the base breeder program, not Clinch River was essential to keeping the United States ahead in breeder development.

As for the alternative financing plan that DOE now is backing, I detailed my reservations in the RECORD July 29. The plan fails Congress' fiscal year 1984 appropriations requirement than there be no further funding of the Clinch River project until a substantial industry cost sharing plan is enacted that would reduce the project's cost to the Federal Government. It exposes none of industry's venture capital to risk. It involves no increase of industry's original contribution to the project. And it actually increases the risks the Federal Government must assume in the probability that cost overruns and construction delays occur.

What makes these points doubly damaging, though, is that the plan's own authors actually confirmed them under questioning at a press conference held July 21. Government, not industry, they conceed would assume all risks under the plan and no new venture capital—industry investment or contributions—is made or placed at risk.

Mr. President, it is essential that the Senate understand the error of continuing to fund the Clinch River project and how insufficient the latest financing scheme is before voting on these issues in September. The pertinent passages from the press conference transcripts of Secretary Hodel speaking on the breeder are important reading as are the articles covering his breeder views and the financing plan's authors own candid admissions about the plan. Mr. President, I ask that these materials be printed in the RECORD, along with four recent editorials that critiqued the financing plan and the project in the Los Angeles Times, the Washington Times and the Washington Post.

There being no objection, the material was ordered to be printed in the RECORD, as follows:

TRANSCRIPT: CRBR PRESS CONFERENCE WITH DOE SECRETARY JULY 21, 1983

QUESTION. I read through the plan and I did not see additional money really additional money really coming from the utilities. Where is that?

HODEL. There is $150 million in equity, there is $175 million in the completion of the contribution commitment from the utility industry which would certainly not be available in the absence of such a plan, as well as the $675 million net from a bonded indebtedness to be undertaken by an entity which I believe is yet to be established.

QUESTION. But you're not talking about money contributed by the utilities over and above what has already been committed, but has not been pledged?

HODEL. In separate contributions. I do not think there are additional utility contributions, but it would be the completion of those and perhaps Mr. O'Connor should respond to that.

O'CONNOR. You are correct. The plan does not provide for additional direct utility contributions. But the financing plan does provide for a financing program that will meet roughly 40 percent of the additional cost or 1 million out of the estimated 2.4 billion dollars that will be required to complete the facility and this will be done largely through borrowing which will be issued at a later date.

QUESTION. Your plan assumes you can borrow at a rate equivalent to a T bill rate equivalent to what the government can borrow. Is that assumption a reasonable assumption?

HODEL. I think perhaps it would be best to have Minor Warner, who is one of the representatives of four of the major investment firms that have reviewed this project and said that it is doable to comment on that Minor.

WARNER. Shall I just talk from here. Yes part of the monies could be raised from the private sector will in fact be sold or priced at a relationship to Treasury obligations.

QUESTION. Mr. Minor, did the WPPSS debacle have any serious impact on your ability to obtain the government guarantees for this?

WARNER. Well, what is contemplated here is not government guarantees, but they are power contracts a, and b, we don't foresee any difficulty.

QUESTION. Are they like revenue bonds that you are talking about?

WARNER. No. As is described more fully in the plan they are really power purchased contract funds.

QUESTION. Bonds that are guaranteed by the sale of the power from the project.

WARNER. There are a number of provisions which in the contemplated contract when it's entered into we could cover all contingencies.

QUESTION. What would be the cost to the Treasury of tax benefits afforded participants?

WARNER. In terms of tax benefits, they would be in connection with the $150 million dollars of new equity contemplated under the plan conventional tax benefits.

QUESTION. How much is that?

WARNER. I think I will defer to legal counsel on that rather than try to give any estimate right now. . . .

QUESTION. Mr. O'Connor, if your cost run above 2.4 billion, will you come back and ask for more federal money

O'CONNOR. Over the long haul, the hope is that the present funding would provide us to the point of completion. We entered in good faith into an agreement about a decade ago, provided for the utilities' contribution and what we thought at that time would be the government's contribution. There is no question that that cost, as with all other costs of building any kind of power plant have increased significantly during that period. But we did feel that this major contribution of a billion dollars in private financing would help considerable to ease the on-budget expenditures that would be required of the federal government and beyond that point of course it really would be up to the federal government.

[UNKNOWN]. Well the Energy Department is going to try to sell this to the Congress on the grounds that this is it. This is the one and only last increment of money to Clinch River. Are you willing to promise that you won't ask for anymore money?

O'CONNOR. We can't promise that in good faith because we don't know what interest rates are going to be or what various sorts of licensing problems might or might not develop, but we do have a high confidence in our ability to complete this plant in [illegible] and to have it operational in [illegible] assuming funding is provided at this point.

QUESTION. What happens if this plan doesn't fly after September 30? Will you go on with any activities at Clinch River or do you have to just drop the [illegible]

O'CONNOR. It would be very, very difficult, if not impossible, to proceed without the approval of this particular plant. So the end of September is really the date on which a lot hangs.

[UNKNOWN.] In my judgment, yes.

QUESTION. To get back to the financing plan, could you explain what exactly assuming there is some problem and the plant doesn't come into operation or doesn't get licensed or isn't completed, what exactly does the industry have at risk financially and what does the government have at risk financially? I am talking about the million dollar industry per billion dollar industry share?

[UNKNOWN.] The industry's total financial commitment, if you include the interest that has accrued on the funds already placed in escrow, will approximately $350 million dollars in total. The remainder of the additional monies to be secured would the $1.4 billion dollars would be the federal governments contribution.

QUESTION. What about that $650 million?

[UNKNOWN.] That would be the borrowing that would be issued against the power that would be bought by companies.

QUESTION. If there is no power, who eats that $650 million?

[UNKNOWN.] Well that's again an assurance that we would proceed with completing the plant. That would be the government in that case.

QUESTION. You are careful to use the word "on budget". Can one conclude from that, in fact, what you're doing is transferring a billion dollars from a non-budget account to an off-budget loan guarantee?

[WARNER.] These are future purchase power contracts. We would anticipate that the Department of Energy would enter into a contract with the borrowing entity which would cover various contingency. This kind of contract would be off-budget.

Question. So basically the industry, through this plan, has not increased it's financial risk in this project by one penny.

[Unknown.] Yes, but the important thing that we were asked to do was to come up with a plan, back in December, asked by the Congress to come up with a plan that would reduce the federal government's exposure and at the same time increase the amount of private capital placed in the program. And that's the plan that we submitted.

Question. But you are not increasing the risk of the—

[Unknown.] Yes. That is correct.

Question. How can the federal government's exposure decrease, I mean their budget outlays are decreased, how does their exposure decrease?

[Unknown.] Because we have a high confidence that the plant will be completed on time and operating.

Question. But not high enough not to require a government transfusion?

[Unknown.] That's correct. And we think that's an incentive to, all real incentive to keep our eye, everybody's eye on the ball on this one.

Question. Under the future purchase power contracts, who are the buyers of these, utilities?

[Unknown.] Yes. Utilities which include both investor-owned companies as well as municipals and REAs.

Question —

[Unknown.] We can provide those with you, and include the Southern Companies, Duke Power. Gosh, we got a whole list of them that we'll be happy to—

Question. Do those letters of intent, include agreements as to what price they will pay for the power?

[Unknown.] No they do not. They contemplate in part, either payment of avoided energy cost, or in part, with respect to several of the rural electric co-ops of the southeast that interested in purchasing capacity from the project which would include more than energy costs. All the estimates in the plan are based on avoided energy cost . . .

Question. Mr. Smith, apparently there are some utilities that feel that they would rather see the money being spent on Clinch River, being spent on R&D for a standardized design-type research for the advanced reactors now?

Smith. That's not a view that's representative of the utility industry generally. Certainly not the position of my company or the companies with whom we work closely.

Question. I guess if you had a choice, if the government came to you, if the Congress came to you and said we got so much money for nuclear research, do you want a breeder or do you want an R&D on light-water reactor, standardized light-water reactor, what should be picked?

Smith. Well you need both of those and it's really not an either or. That's like saying to the Air Force you can have fighters, but you can't have bombers. Which do you want, fighters or bombers.

Question. You make choices every day. Which one would you make?

Luncheon Meeting With Donald Hodel, Secretary of Energy

PRESENT

Donald Hodel, Secretary of Energy.
James R. Whelan, Editor and Publisher.
Ron Cordray, National Editor.
Ted Agres, Assistant Managing Editor.
Woody West, Editorial Writer.
Coit Hendley, Managing Editor.
Ralph Hallow, Deputy Editor, Editorial Pages.
Ed Rogers, National Reporter.
Connie Stewart, Press Secretary.
Philip Keefe, Deputy Press Secretary.
Dave Hoffman, National Reporter.
Paul Boyer, Intern.
Jeff Brown, Intern.
Larry Lambert, Photographer.

Mr. Cordray. Before you leave nuclear, could you talk a little bit about Clinch River?

Secretary Hodel. What do you want me to say about it?

Mr. Cordray. Should we continue it?

Secretary Hodel. We are working hard. We are in a process where we are trying to find a way to present a funding mechanism which will be satisfactory to the Congress.

Mr. Rogers. Is there any hope?

Secretary Hodel. Yes, as long as there is life, there is hope. It sounds evasive only because it is. The fact is, nobody can tell you today what will happen to Clinch when we go forward with a proposal to the Congress. In other words, you would like a definitive answer from me, by golly, we are going to do so and so.

Mr. Whelan. What is wrong with Clinch?

Secretary Hodel. I can't give that to you. If what you want is an analysis of the process, that I can give to you, and the process is, both Houses of Congress have now left the door open for us to put together a package and try to sell that package if we think it is salable to provide this alternate financing.

Mr. Rogers. And there is the almost universal belief that industry was not going to come through with an adequate proposal.

Secretary Hodel. Well, it depends on who we talk to.

Mr. Cordray. Industry isn't even funding what they promised to in the first place.

Secretary Hodel. They are committed to complete their contributions, as I understand it.

Mr. Cordray. According to Mr. Humphrey.

Secretary Hodel. Well, if your desire is to kill the project, I am sure you will naturally put ever negative interpretation on the events that you can. If you had to say today that all the pieces are together for a completely workable process, that is exactly what I have said to you. That it is not. That is what we are working on.

Mr. Hallow. I think it is fair, Mr. Secretary, to point out that we understand, although you read every editorial that we write, you cannot remember every position we have taken on everything.

Secretary Hodel. That is right. I am a subscriber to your paper and to no other.

Mr. Hallow. We have urged the death of Clinch River.

Mr. Whelan. Let me ask the question, what is wrong with Clinch River? What is wrong with it?

Secretary Hodel. Well, ask the guy who wrote the editorial. I tried to save it.

Mr. Hendley. We don't trust him. We would like to hear your viewpoint.

Mr. Cordray. What is right with Clinch River?

Secretary Hodel. What is right with Clinch River is that the United States needs, in my view, to retain a position in the breeder program.

Mr. Whelan. Sure.

Secretary Hodel. What is wrong with Clinch River is that you don't necessarily have to have Clinch in order to do that.

Mr. West. Aren't you holding our breeder research hostage to a project that has become so pervasively——

Secretary Hodel. There are those that believe that if you lose Clinch, you lose it all. Proponents of Clinch, of the breeder, will say to me, if we lose Clinch, we lose it all. I think it is entirely possible you could have an alternative approach, but if knowledgeable legislative strategists say that, you have to pay some attention to it. I mean, if you care about the program. If you don't care about the program, okay, we will take your advice, win, lose, or draw. So, you are trying to do something responsible.

Breeder R and D, I think, is essential if we are going to maintain any position—not Clinch, but breeder R and D is essential if we are going to maintain any position at the non-proliferation table.

Hodel: Clinch Breeder Reactor Unnecessary

Washington (UPI)—Energy Secretary Donald Hodel said in an interview released Sunday the United States does not need the embattled Clinch River nuclear breeder reactor in order to keep its place in the international breeder program.

The Clinch River project in Oak Ridge, Tenn., is intended to be the Nation's first demonstration breeder reactor—a power plant producing more uranium fuel than it consumes.

The Reagan administration under pressure from Congress agreed that the project only would be continued if the utility industry provided significant portions of its financing. The industry has been unable to reach agreement with the administration and Congress on a specific financing plan.

"The United States needs, in my view, to retain a position in the breeder program," Hodel told the Washington Times. "The Japanese, the French, the British, the Germans, the Russians are all proceeding with the breeder. They have urged us to continue and complete Clinch. I think it is partly because they are looking for evidence that we are going to stay active in the breeder program."

But, Hodel added, "you don't necessarily have to have Clinch in order to do that."

"Proponents of Clinch say to me, if we lose Clinch, we lose it all. I think it is entirely possible you could have alternative approaches," he said. He did not detail what alternative approaches might be taken.

Hodel said some people argue that other nations are ahead of the United States on some aspects of breeder technology, "and they are behind us in others."

Environmentalists oppose the U.S. project because they believe the fuel produced by the breeder will be used to make nuclear weapons. The nuclear industry wants the project because it believes uranium fuel will become scarce some time in the next century.

Hodel said many anti-nuclear and environmental activists are more interested in preventing the United States from achieving energy growth and development than in promoting their causes.

The activists "genuinely, generally oppose the growth syndrome and all that comes with growth," he said. "They correctly perceive that if you can choke off the energy supply to this country you will choke off the development of industry and jobs and commercial activity and transportation and the like."

Hodel charged opponents of industry on the acid rain issue "use an incredible point. There is no question there is something out there called acid rain. We do not know its total implication. We do not know what its sources are . . . (but there is) a fair chance that we will be faced with spending billions of dollars a year trying to alleviate some part of the problem.

"Proponents of a measure like the acid rain proposal vastly underestimate its cost to the society," he said.

[From the Nucleonics Week, June 30, 1983]

Hodel Sees R&D, Not a Machine, Dominating U.S. Breeder Scene if CRBR Dies

DOE will continue a base breeder program whether or not the Clinch River Breeder Reactor project is funded by Congress, but "we may not want a demonstration program," Energy Secretary Donald Hodel said in an interview last week. Among other things, the program keeps the U.S. active in the international nonproliferation arena and helps it retain the option to build a breeder in the future, Hodel said. He cautioned that his comments shouldn't be read as an indication that he thinks CRBR won't be re-funded, because the final report on cost sharing must still be considered. Nor would failure to fund the project mean that the $270-million DOE requested for CRBR in FY 84 would necessarily be turned toward other nuclear, or even energy, programs, Hodel told Nucleonics Week.

"The research work that needs to be done we still need to continue," Hodel said when asked about the fate of the base breeder program. "And in so doing, we continue to be participants in the international activities and we have proliferation benefits as well as the opportunity to keep the technology moving in such a way that when the United States decides it wants to go for a breeder, we've got a foundation laid that permits us not only to have the technical and the professional ability, but also presumably the ability to build a licensable project."

The U.S. remains on the "cutting edge of technology" in some aspects of the breeder, he said, and should remain there because it gives the U.S. something to offer in return for concessions and agreements concerning proliferation. Without the base breeder program, "we have lost our seat at the table with the rest of the world, which is proceeding with breeders. . . . If we back out of the program, forget it. I just can't see us doing that, at a very political level," Hodel continued.

[From the Los Angeles Times, July 28, 1983]

Uncle Sugar, Caught in the Clinch

On May 12 the U.S. House of Representatives voted 338 to 1 to kill the Clinch River breeder reactor program unless private industry agreed to pay a substantial share of the cost. Six weeks later Energy Secretary Donald P. Hodel publicly conceded that the U.S. energy program could make do without the $4 billion nuclear project.

That should have been that.

But, lo and behold, President Reagan let it be known the other day that he not only supports Clinch River but also will campaign vigorously for a special $1.4-billion appropriation to keep the Tennessee project alive. Not only that, he also favors federal guarantees under which the taxpayer will bail out corporate and private investors if electric power from the breeder reactor cannot be sold.

All this comes at a time when Reagan is wrestling with massive federal budget deficits. Unless the projected deficits can be reduced, it will be very difficult to avoid high interest rates, renewed recession and a situation in which military spending will have to be cut much more deeply than the President himself considers prudent.

Fortunately, chances are very good that common sense will prevail in Congress, where enthusiasm for the Clinch River boondoggle is at a low ebb.

Unlike conventional nuclear-power reactors, which burn uranium, breeders both burn and breed plutonium. In fact, they are designed to produce more plutonium than they consume. This was a very attractive feature at a time when uranium was expected to become scarce and increasingly costly.

But times have changed since Congress first gave tentative approval to construction of a commercial-scale breeder reactor 13 years ago.

Leaving aside the fact that the United States should not be setting a bad example by embracing a power-reactor technology that can easily be used as a cover for nuclear-bomb production, the economic factors are all wrong.

More uranium reserves have been discovered. The demand for uranium reactor fuel has fallen way below earlier projections for several reasons, including the fact that nuclear-power reactors are neither as safe nor as economically efficient as had been expected. The General Accounting Office has estimated that breeder reactors probably will not be commercially attractive for 40 more years.

Meanwhile, instead of the original cost estimate of $700 million, the ultimate price tag is now expected to be at least $4 billion and possibly much more.

Under these circumstances Congress has become more and more reluctant to vote money for Clinch River. This spring it became obvious that the project would die unless the electric utilities and the nuclear industry agreed to pick up a substantial share of the costs. The resulting "cost-sharing" plan that has now received the President's backing was accurately described by Representative Richard L. Ottinger (D-N.Y.) as a "sham . . . an insult to the intelligence of Congress and the American people."

Under the proposal the federal government would spend $1.4 billion on top of the $1.5 billion that it has already sunk in the project. Private industry, which so far is committed to paying only $257 million of the total cost, would raise $1 billion more through the sale of bonds and equity shares in the project.

The catch is that these securities would be guaranteed by the federal government. In other words virtually the entire risk would be assumed by good old Uncle Sugar.

It's incredible that a President who has so often lectured on the evils of federal spending in general and subsidies in particular would throw his weight behind such an arrangement. It's up to Congress to save the American taxpayer from the consequences of this particular folly.

[From the Washington Times, July 27, 1983]

CLINCH RIVER AND CORPORATE WELFARISM

(By Smith Hempstone)

You have to wonder what Senator Majority Leader Howard Baker has in mind with his apparent willingness to endorse a scheme to keep alive the Clinch River breeder reactor. Getting his fingerprints all over this monstrosity won't do him any good in pursuing the GOP presidential candidacy in 1988. By then, it will be all too clear just how much of a fraud on taxpayers Clinch River is.

When the project was first authorized in 1971, it was supposed to cost $400 million, with the nation's electric utilities signing up to contribute $257 million. A year later, the projected cost jumped to $700 million, but the utilities demanded their share be frozen at $257 million.

Now the Energy Department admits the project will cost at least $4 billion to complete. Congress hit the roof over this, with the House defeating a funding bill which carried in the Senate by only one vote.

The lawmakers told the Energy Department to look at alternatives, "including reconsideration of the original cost-sharing arrangement, that would reduce federal budget requirements" for Clinch River. The upshot was a recommendation that the government use revenues that might be made from the sale of electricity from Clinch to back guaranteed bonds for the project. But those revenues were originally supposed to go directly into the U.S. Treasury to offset the project's costs.

Reception to this by Congress was cool, with its General Accounting Office noting that "the federal government still appears to retain most risks if the project fails or if cost overruns occur."

Nevertheless, the plan Baker has to decide to snub or go for now calls for Congress to obligate, in one up or down vote, $1.5 billion over the next seven years for construction. Just perfect for Clinch backers, since it would remove the issue from further congressional consideration for seven years.

Even lovelier for the nuclear industry, who wouldn't have to kick in another dime of its own. The proposal talks about another $175 million from the utilities, but this is already what they owe from their original pledge of $257 million plus interest.

The utilities insist they will not participate unless they're guaranteed tax benefits and a fixed rate of return on the bonds. And for good reason from their viewpoint. Although industry claims it's going to put up risk capital or equity shares worth $150 million, it wants the money to come from the taxpayers—that is, from the tax benefits the plan hands to industry.

The utilities, further, assume no additional risk for failure, delay or cost overrun. In fact, their plan emphasizes the government (i.e., the taxpayers) must guarantee all the tax benefits and a full return on investment plus interest for the government-guaranteed bonds. Never mind if the project costs more than expected, fails to work as well as expected, or never gets built, or if there's no market for the electricity it may or may not produce. Talk about corporate welfarism!

Energy Secretary Don Hodel has admitted that building Clinch River isn't necessary for maintaining America's position in breeder-reactor technology because our basic breeder research program would do the job. This basic breeder research is funded separately from Clinch and is already costing the government some $300 million a year. Apparently industry agrees with Hodel, since it doesn't think it should share Clinch River's costs by increasing its share of contributions beyond the measly 9 percent it has pledged—9 percent of $4 billion!

You want to know how this compares with other nations' cost-sharing on breeder work? Well, West Germany requires private industry to pay—not loan—29 percent, and when costs increase, the German private sector's share must escalate accordingly.

Japan, which supposedly is the world-champion at government-private industry coziness, requires at least 20 percent private-sector direct payments (not loans) to finance its commercial breeder effort. By the way, the U.S. utility industry originally offered to pay for half of Clinch River.

The French breeder program is paid for entirely by utility rate increases and foreign cost sharing: 51 percent by the French national utility, 30 percent from an Italian utility, and the balance by a consortium of German, Belgium and Dutch utilities.

You might put this question to Senator Baker and to the free-marketeers of the Reagan administration, who apparently remain enamoured of the project: Will the plan increase the private sector's management stake?

A "yes" would be hard to explain, since it's the Energy Department that would get even more say and less public scrutiny. If you think that's a smart idea, you have forgotten the mess that department made of oil and gas distribution and pricing before President Reagan ended controls on the petroleum industry.

The fact is, this plan continues to insulate industry from risk. So why in the world would Baker even consider pushing a plan like this on the public? People who know him say when he has a chance to review what his plan is really about, he'll recognize it's not worth the game and that the real issue isn't this project but, as Secretary Hodel points out, keeping the basic breeder program going in order to retain U.S. lead in this technology, which is what Baker says is his primary concern, too.

[From the Washington Post, July 20, 1983]

DOUBLE STANDARD AT CLINCH RIVER?

The Clinch River breeder reactor is the great exception to the Reagan administration's rule against energy subsidies. The White House has never subjected the breeder to the same standards that it has applied elsewhere. Another attempt to rescue the breeder is now taking shape, and once again it requires an exemption to all the Reagan strictures against public spending and lending.

Congress refused any appropriation this year for Clinch River, declaring that there will be no more federal money until and unless somebody comes up with an acceptable plan for a larger share of private money. Part of the electric power industry has now come up with a proposal. The private money would be mainly in the form of loans guaranteed by the federal government. But guaranteed loans are not everybody's idea of a private contribution.

To complete the breeder reactor would, according to the Energy Department, take a further six years and $2.4 billion. The current financing plan comes from the Breeder Reactor Corp., which represents a group of utilities supporting the Clinch River project. This plan proposes that the utilities contribute another $150 million in equity, and the government put up $1.5 billion. The remainder would be raised by the guaranteed bonds, to be paid off by the breeder's power sales.

One obvious difficulty is in the utilities' contributions. State regulators are not visibly enthusiastic about allowing the utilities to pass them on to customers in their power rates.

As for the bonds, Sen. Gordon Humphrey points out that the arithmetic of repayments depends on some cost estimates that seem low and a predicted price for breeder power sales that looks remarkably high. The idea of the bonds arrives in a season when there seems to be rising concern both in Congress and in the administration over the scale of federal lending, and over the use of loans to circumvent the restrictions of a tight budget. It's a bad practice. Why make an exception for Clinch River?

The breeder reactor has only one justification. It gets more energy out of a uranium atom, by recycling it, than the present commercial reactors do. The Clinch River breeder was conceived at a time when it looked as though a uranium shortage lay ahead. But with new uranium discoveries, the economic case for the Clinch River breeder has evaporated at just about the same rate at which the construction cost estimates have been rising.

The immediate question is whether the White House will support this current financing plan with its $1.5 billion appropriation and its bond guarantees. If it applies the same standards to the Clinch River breeder that it applies to all the other energy technologies, the question will answer itself.

[From the Washington Post, July 2, 1983]

WILL CLINCH RIVER RISE AGAIN?

If a cat has nine lives, how many does the Clinch River breeder reactor have? It's true that there was no money for Clinch River in the energy appropriations bill that Congress just passed for the coming year. But you would be incautious to assume that the project is dead. It's a little too soon to celebrate.

Perhaps some money will be tucked into a supplemental appropriations bill. Or perhaps someone in Congress will start hearings on legislation for a financial reoganization. Meanwhile, construction crews are working double shifts in Tennessee on what they carefully call "site preparation," and three-quarters of the components have already been ordered or actually delivered. Hurrying to spend more money, the reactor project's managers keep asking whether, in view of all the money already spent, it doesn't make sense to go ahead and finish it.

No, it doesn't. The resistance to the breeder reactor is being led in the Senate by fiscal conservatives who have pointed out the very expensive fallacy in that logic.

But there's another and even stronger reason to abandon the breeder. The breeder runs on plutonium, a substance that is not only highly toxic but capable of being fabricated with only moderate difficulty into nuclear weapons. That job does not necessarily require the resources of a government. A sophisticated terrorist organization could make a bomb from stolen plutonium. Deliberately to develop a technology that requires this substance, and introduces it into the civilian economy, would be wanton.

The breeder was conceived at a time when uranium was scarce. But since then enormous reserves of uranium have been discovered, and it is clear that demand through at least the first half of the next century will be a small fraction of the original estimates. Recycling plutonium, with all its enormous risks, cannot be justified by any visible need.

Congress did not quite explicitly kill the Clinch River breeder in its recent appropriations bill. It only said that there would be no more money until there was an acceptable financial reorganization—meaning a larger contribution from the electric utilities that are supposed to be the beneficiaries. Some utilities, still committed to the idea, are now pushing for loans guaranteed by the government. If Chrysler got guaranteed loans, why not Clinch River?

The answer is that neither the utilities nor the federal government has the money to spare. The further and stronger answer is that, even if it were free, the breeder is the wrong path for nuclear energy to take. ●

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Senate

THE ORIGINAL CLINCH COST SHARING PLAN: A MODEL IGNORED

● **Mr. HUMPHREY.** Mr. President, last December the Congress agreed in conference to ask the Department of Energy (DOE) to "vigorously explore proposals, including a reconsideration of the original cost-sharing arrangement that would reduce Federal budget requirements for the Clinch River project." DOE has settled on a plan that would simply have the Government lend money to itself through the sale of Government guaranteed bonds to spread out the spending on the Clinch River project.

What is disturbing about this plan and the study DOE has done at a cost of $1 million is that they simply ignore Congress instructions. We asked for a proposal that would increase industry's share of the project's cost and risk, we got a plan that ironically increases Government's risks and costs. I have already submitted a detailed analysis in the July 29 RECORD as to why the plan DOE has been asked to back is unsound.

At first it is difficult to understand how DOE could get behind such a plan. But, then, when you look at who DOE asked for help, the Breeder Reactor Corp. (BRC), it is not so difficult to fathom. This corporation, after all, stopped soliciting for utility contributions to the Clinch River project back in 1977, nearly 6 years ago, and is unwilling to solicit now for fear of being rejected. Under these pressures, it is not surprising that BRC came up with a plan that provides industry with Government guarantees against any risk and that asks for no further investment of industry venture capital.

For the same reason, DOE carefully avoids complete reference to Congress instructions when claiming it answered Congress request. Rather than cite the full instructions for DOE to "vigorously explore proposals, including a reconsideration of the original cost-sharing arrangement, that would reduce Federal budget requirements for the Clinch River project," DOE and BRC cite these instructions with a conveniently placed ellipsis that eliminates any reference to reconsidering the original plan.

This is no accident. There is nothing in the plan DOE is now backing that is any way remotely similar to the original cost-sharing plan, which at first had industry paying for most of the project and that was finalized in 1973 with industry paying at least 40 percent of the project's cost without it getting any equity share or ownership in the plant itself. Had the BRC or DOE reconsidered this original plan, Congress would have a plan before it today with some semblence of true cost sharing in it.

DOE and the BRC, though, were unwilling even to discuss the project's original cost sharing plan in their studies. I, therefore, asked the Congressional Research Service (CRS) to detail this plan and to describe the history of the project's private sector participation in general. The study that CRS filed, "Private Sector Participation in the CRBR Project," is quite sound.

This history correctly notes that the Clinch River breeder reactor project originally was publicly understood to be what it in fact is, a demonstration project. Thus, it was known not as the Clinch River breeder reactor project, but as the breeder demonstration program. Also, when the project was first authorized in 1970, the Federal Government treated it as a demonstration similar in character to the light water reactor demonstration effort of the 1950's. The Federal Government assumed that the private sector—the nuclear utilities and the nuclear vendors—would pay for nearly all of the project out of their pocket and Government would only help by affording its research facilities and nuclear fuel to the project.

Mr President, before the Senate votes in September on a plan DOE claims answers Congress request for true cost sharing in the spirit of the original proposals agreed to in the early 1970's, it is essential that it know what these earlier cost-sharing agreements were. I ask that the full text of the CRS study be placed in RECORD.

The material follows:

BRIEF HISTORY OF PRIVATE PARTICIPATION IN THE CLINCH RIVER BREEDER REACTOR PROJECT

The fiscal year 1984 Energy and Water Development Appropriation Act (Public Law 98-50) has been signed into law, without any funding for the Clinch River Breeder Reactor Project (CRBR). However, appropriations committee reports from both houses of Congress (H. Rept. 98-217 and S. Rept. 98-153) note that FY84 funding for CRBR might be provided if an arrangement that increases the amount of private financing for the project can be approved. It is likely that Congress will be asked to consider such an arrangement shortly. As an aid in the consideration of new proposals for private financing of the Clinch River Breeder Reactor Project, this report reviews the history of private financial contributions to the project and what the private sector was to get in return.

EARLY HISTORY OF THE BREEDER REACTOR DEMONSTRATION PROJECT [1]

Public Law 91-44 (The Atomic Energy Commission Authorization Act for fiscal year 1970), Section 106, authorized the Atomic Energy Commission (AEC) to participate in the Project Definition Phase of a Liquid Metal Fast Breeder Reactor (LMFBR) Demonstration Program under cooperative arrangements with reactor manufacturers and others in accordance with criteria that had been previously reviewed by the Joint Committee on Atomic Energy (JCAE). These criteria, titled "Statutory Criteria for Fourth Round Arrangements Under the Commission's Power Reactor Demonstration Program," envisaged limited AEC assistance to the private sector in building a demonstration LMFBR. The program was conceived as an extension of earlier AEC assistance programs that led to the commercialization of light water reactors.

The criteria established a two-phase program. Under the first, or Project Definition Phase, the AEC entered into a number of contracts with reactor manufacturers with the objective of determining whether sufficient bases existed for a definitive cooperative arrangement. Under the second phase of the program the AEC undertook negotiations with reactor manufacturers and utilities that eventually led to contracts to construct and operate an LMFBR demonstration plant.

The criteria listed several types of assistance that the Government was prepared to consider providing to such demonstration projects. In general, the assistance corresponded to that furnished under earlier cooperative demonstration projects. It was contemplated that the demonstration plant would be financed and owned by a utility, or group of utilities, and that governments assistance would be strictly limited as to type and amount.

In June 1970 Congress approved the fiscal year 1971 AEC Authorization Act (P.L. 91-273), which authorized the AEC to enter into a cooperative arrangement with a reactor manufacturer and others for participation in the research and development, design, construction, and operation of an LMFBR powerplant in accordance with the Statutory Criteria previously submitted to the JCAE. The AEC was authorized to provide financial assistance to the project totaling $50 million minus the costs of the Project Definition Phase, supply up to $10 million worth of fuel free of charge; and provide the project with up to $20 million in the form of services, facilities, or equipment otherwise available to the AEC under its civilian base program.

At that time the demonstration LMFBR was estimated to cost about $400 to $500 million. As negotiations between the AEC, reactor manufacturers, and utilities proceeded, it became apparent that additional Government funds above the $80 million authorized in P.L. 91-273 would be needed to gain private participation in the project.

In a June 4, 1971 message to Congress on energy, President Nixon stressed the importance of demonstrating breeder reactor technology and requested that an additional $50 million be authorized for the demonstration LMFBR. Congress went beyond that request, in the FY 1972 AEC Authorization Act (Public Law 92-84) by raising the authorization for direct assistance to the project to $100 million and removing the $20 million limit on indirect assistance provided from the base program in favor of a limit of 50 percent of the capital cost of the plant.

By 1971 the form that private participation in the project might take had become less clear. Utility ownership of the plant was still envisaged as the principle source of private funding, but other sources were now anticipated as well. According to AEC testimony before the JCAE: [2]

"The financial participation of the electric utilities is expected to be of two principle forms. An owner utility or group of utilities are expected to participate financially on a basis consistent with the value of the plant as an electric power producer over the projected useful lifetime of the plant. Although the specific basis for determining this value is yet to be worked out, this direct financial participation could be in the range of $75 to $150 million and even as high as $200 million. . . . Additionally, it is expected that the owner utilities, other utilities throughout the Nation, and others in the energy-related equipment industry, would be prepared to participate in (a) the cost of research and development, (b) first-of-a-kind costs, and (c) the financial uncertainty associated with the availability of this plant as a power producer."

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[1] This section is adapted from a letter from Robert C. Seamans, Jr., Administrator, Energy Research and Development Administration to Hon. John Pastore, Chairman, Joint Committee on Atomic Energy. Reprinted in U.S. Congress. Joint Committee on Atomic Energy. Modifications in the Proposed Arrangements for the Clinch River Breeder Reactor Demonstration Project. Hearings, 94th Cong., 2d Sess., Apr. 14 and 29, 1976. Washington. U.S. Govt. Print. Off., 1976 p. 58-9

During 1971, the utility industry organized a fund-raising campaign for the demonstration LMFBR with a goal of raising $250 million. At the AEC's request the Edison Electric Institute (EEI), American Public Power Association (APPA), and National Rural Electric Cooperatives Association (NRECA), surveyed member utilities as to their interest in owning and managing the demonstration LMFBR. In January 1972, the AEC accepted a proposal from Commonwealth Edison (CE) and the Tennessee Valley Authority (TVA) as the basis for negotiations of a definitive arrangement.

As these negotiations continued, it became apparent that the utility financial contribution—both of the utility industry as a whole and those of TVA and CE—were to be limited in amount, and the utility industry was not willing to underwrite any additional risk including liability. If the project was to proceed, the AEC would have to assume the open-ended risk of project cost overruns and other financial risks.

After lengthy negotiations between the JCAE, and AEC, and officials of CE and TVA, the project participants signed contracts in 1973 under which the Government agreed to accept the open-ended financial risks from the project (see below). However, neither the program authorization nor the Statutory Criteria were changed until 1975 to recognize this very basic change from the ground rules on government assistance.

ORIGINAL CONTRACTS FOR THE LMFBR DEMONSTRATION PLAN

The basic contracts for the breeder demonstration project were signed by five parties on July 25, 1973. The signatories represented the Atomic Energy Commission; the Tennessee Valley Administration; Commonwealth Edison Company; the Project Management Corporation (PMC), which was established to provide overall management and coordination for the project; and the Breeder Reactor Corporation (BRC), which was organized to represent the interests of a large number of utilities that pledged to contribute funds.

The main contract was a 4-party agreement between the AEC, TVA, CE, and PMC (contract number AT(49-18)-12), which set out the responsibilities and authority of the parties to participate cooperatively in the design, construction, and operation of a demonstration LMFBR plant. PMC and BRC simultaneously signed a contract, which established how utility funds would be made available, and the AEC and BRC signed a contract (AT(49-18)-14), which defined their relations.

Project resources

Paragraph 7 of the 4-party agreement sets specific limits on the resources to be supplied to the project by the utilities (through BRC), TVA, and CE. The utilities agreed to provide approximately $250 million in ten equal yearly installments. TVA agreed to provide the site for the plant, power transmission facilities, $2 million (above contributions through BRC), and the availability of top management for project guidance. CE also agreed to provide $2 million and the availability of top management. Reactor manufacturers were not party to the agreements, but the AEC expected manufacturers to contribute about $20-40 million to the project.[3]

Additional resources to be made available to the project included, income from the sale of electricity produced during the first five years of operation, plutonium bred during that period, and any funds from the sale of the plant or part of its property. TVA agreed to purchase the electricity produced during the first five years at the highest incremental cost of generating the electricity that it otherwise would have used. At the end of the 5-year demonstration period, TVA would have the option to purchase the plant under a pricing formula specified in the 4-party agreement. The AEC agreed to accept custody and ownership of the plant upon termination of the contract; or upon its expiration, if TVA did not exercise its purchase option.

All remaining resources for the project were to be supplied by the AEC. The AEC agreed to provide funding pursuant to its authority under PL. 92-84, discussed above. Furthermore, the AEC agreed that if at any time the resources available to the project appeared to PMC to be insufficient to conduct project activities it would make a good faith effort to obtain additional legislative authorization and funds. In addition, the AEC agreed to indemnify TVA, Commonwealth Edison, and PMC against claims and liabilities of third parties arising out of project activities.

When the contracts were executed, in 1973, the cost of the plant and the first five years of operation was estimated to be $730 million. Estimated project resources as of July 1973 in millions were:[4]

Utility contributions	$254
Reactor manufacturers	20-40
AEC direct assistance	92
AEC base program	320
AEC furnished fuel	10
Revenue from electricity sale	31
Total	727-747

Possible revenue from the sale of the plant at the end of the five year demonstration period was not included in the above estimate, but as noted above the 4-party contract specified that any such revenue would be available to the project.

Utility benefits of project participation

The major benefit that the utilities expected to receive from their contributions to the breeder reactor demonstration program was realization of the projects principal objective of furthering the development of the LMFBR as an energy conversion option. Additional benefits included participation in the definition and management of the project and free access to all information and patents produced as a result of project activities.

The 4-party contract vested overall project management authority in the PMC, through its Board of Directors and a Project Steering Committee (PSC). The Board established the general policies of the project and had oversight over all activities. It consisted of 2 members selected by TVA, 2 members selected by CE, and one member selected by BRC. According to the 4-party contract the AEC was to seek the necessary legislative authority to permit two of its officials to serve on the PMC Board. However, Congress never granted that authority.

The responsibility for day-to-day management of the project was given to the PSC, which was composed of one representative each from TVA, CE, and the AEC. However, lead roles for various aspects of the project were assigned to the participants. The AEC had the lead role for the nuclear steam supply system (i.e. the reactor and associated equipment), TVA had the lead role for plant operation, and PMC and its staff had the lead role for the balance-of-plant and for integration of over-all plant activities.

The contracts established an appeal mechanism to resolve disagreements among the parties. Appeals proceeded from the steering committee to the PMC Board and then, upon the request of any steering committee or Board member, to the heads of TVA, CE, and the AEC. Unanimous agreement was needed at the last level before a problem could be resolved.

In addition to their input to project management, the utilities were given broad access to information. The contract specified that all patent rights, and ownership of all other information produced as a result of project activities including, drawings, specifications, technical data, and reports would belong to the Government. However, BRC, PMC, and the electric utilities which contributed to the project would be afforded royalty-free rights to use the information, inventions, and patents produced.

In addition, participating utilities were given the right to assign personnel to observe and engage in project activities and receive training. BRC was to be kept informed of all significant matters affecting the project and was to transmit this information to the participating utilities and to the public.

Several conditions for termination of the project are established in the 4-party agreement, including such reasons as failure to receive the necessary permits for the construction or operation of the plant, or the existence of insufficient resources to permit the effective conduct of the project. In the event of termination, the contributing utilities are entitled to receive as settlement any unpledged funds in a proportionate ratio to their contributions. There is no contractual provision for refund of utility contributions to BRC.[5]

1975-76 CHANGES IN THE STATUTORY CRITERIA AND PROJECT CONTRACTS

By February 1975, within 1½ years of the signing of the contracts for the breeder demonstration program, the estimated net cost of the project (after subtracting projected revenues from electricity sales during the 5-year demonstration period) had increased from $699 million to $1.736 million.[6] The relatively fixed utility and manufacturers contribution to the project was then estimated at about $288 million. Hence, it became apparent that under the existing contracts the Government would be responsible for the great majority of the project costs. In response to this new funding situation, Congress revised the project authorization and approved new Statutory Criteria to allow for broader Government financial participation in the project. The contracts between the project participants were also modified to give the Government increased control of the project to go along with its increased funding.

Revised authorization and statutory criteria

Following the increase in project cost estimates in 1975, significant opposition to the breeder demonstration project (which was now named the Clinch River Breeder Reactor Project—CRBR) began to appear in Congress. Nevertheless, Congress authorized continuation of the project in Public Law 94-187, the fiscal year 1976 authorization act for the Energy Research and Development Administration (ERDA).

That act provided for substantial increases in the Federal share of the CRBR project. Specifically, Public Law 94-187: (1) eliminated the Government spending limit of 50 percent on the capital cost of the plant; (2) authorized new spending of $181.5 million on the CRBR above the $100 million previously authorized; (3) provided for yearly project spending authorization; (4) removed the previous distinction between direct project funding and funding for CRBR from the base breeder program, and (5) specified a procedure under which the Joint Committee on Atomic Energy (JCAE) could approve of new Statutory Criteria for revised contract negotiations for the project.

In addition, Public Law 94-187 for the first time authorized the provisions already included in the project contracts under which the Government indemnified the other project participants against third party claims. The act also authorized ERDA to acquire ownership of the CRBR plant.

ERDA gained additional freedom to broaden its participation in the CRBR project on April 29, 1976, when the JCAE approved the "Amended Statutory Criteria for Fourth Round Arrangements Under the Energy Research and Development Administration's Power Reactor Demonstration Program," which had been proposed by ERDA in February 1975.

The amendments to the Statutory Criteria: (1) changed provisions calling for "maximum industrial and utility participation" in the project to "meaningful industrial and utility participation"; (2) removed provisions limiting ERDA equipment funding to first-of-a-kind equipment, (3) provided for the first time for ERDA funding of construction of buildings and related facilities, and (4) provided for ERDA to modify the project contracts to assume PMC's responsibilities for overall project management.

Modified project contracts

The JCAE approval of the amended Statutory Criteria allowed ERDA to execute new contracts with the CRBR project participants in accordance with negotiations that had been proceeding for more than a year. The purpose of the new contracts was to increase the ERDA role in overall management of the project to be more in line with its share of the funding, while preserving the utilities rights to royalty-free use of inventions and information and their right to assign personnel to the project. On May 4, 1976, modifications to the 4-party contract and the other project agreements were executed.

The major change in the new contracts was that responsibility to manage the project was shifted from the PMC to ERDA. ERDA was to establish an "integrated project management organization" comprised of PMC, industry, and Government personnel under ERDA direction. Significant project matters were still to be referred to the PSC, but for review only rather than decision. The appeal mechanism for disagreements among the participants on significant matters was retained, but the Administrator of ERDA was given the authority to decide matters upon which the heads of ERDA, TVA, and CE could not reach unanimous agreement.

ERDA's freedom to direct the project, though substantial, was somewhat constrained by contract provisions requiring the agency to design and build the LMFBR demonstration plant in conformance with a specified reference design and to follow certain principal project objectives. ERDA's failure to do so could be grounds for termination of the agreements.

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[3] U.S. Congress. Joint Committee on Atomic Energy. AEC Authorizing Legislation Fiscal Year 1972. Hearings. 92nd Cong., 1st Sess., Mar. 4, 1971. Washington, U.S. Govt. Print. Off., 1971. p. 702.

[4] U.S. Congress. Joint Committee on Atomic Energy. Modifications in the Proposed Arrangements for the Clinch River Breeder Reactor Demonstration Project. Hearings, 94th Cong., 2d Sess., Apr. 14 and 29, 1976. Washington, U.S. Govt. Print. Off., 1976. p. 365.

[5] U.S. Library of Congress. Congressional Research Service. Overview of Legal Issues Governing Contract Liability in the Event of Termination under the Private Participation Contracts for the Clinch River Breeder Reactor Project. Memorandum, by Robin Jeweler. Sept. 28, 1982. Washington, 1982. 6 p.

[6] JCAE Hearings on Modifications in the Proposed Arrangements, op. cit., p. 71.

Another major change made in the new contracts was that ownership of the demonstration plant was shifted from PMC to ERDA, subject to TVA's rights to future ownership following the 5-year demonstration period.

No significant changes were made in the agreements regarding the private sector financial contributions to the project, their access to any information or patents produced, or their right to place personnel in key project positions.

THE CURRENT SITUATION

The 1975/76 Statutory Criteria and Contracts are still in effect and govern the private sector contributions and benefits from the project. The Department of Energy (DOE) has taken over the responsibilities given to ERDA.

DOE's most recent estimate is that it will cost a total of $3.9 billion to complete the project. Of that total, about $1.5 billion has been spent. Thus far the private sector has contributed about $150 million to the project. According to current agreements, the total private sector contribution, including interest, is estimated to be about $325 million. However, a BRC Task Force has developed a plan to modify financing for the CRBRP.[7] The Reagan Administration supports the plan and is preparing a legislative proposal to implement it.

ADDENDUM—SUMMARY OF KEY EVENTS RELATING TO PRIVATE PARTICIPATION IN THE CLINCH RIVER BREEDER REACTOR DEMONSTRATION PROGRAM

DATE, EVENT, STATUS OF PRIVATE PARTICIPATION

July 11, 1969, P.L. 91-44—AEC authorized to begin project definition for a cooperative LMFBR demonstration program under criteria which specify limited Government assistance to a utility owned facility.

June 2, 1970, P.L. 91-273—AEC authorized to enter into a cooperative arrangement to build and operate a demonstration LMFBR. Up to $80 million in Federal assistance authorized for a privately owned project estimated to cost $400-500 million.

March 4, 1971, JCAE hearing—AEC testified that anticipated private funding for the LMFBR includes up to $200 million from a utility owner and additional contributions from other utilities throughout the nation.

Early 1971—The electric utility industry organized a fund-raising campaign with a goal of obtaining $250 million from utilities with no ownership interest in the LMFBR plant.

August 11, 1971, P.L. 92-84—Congress authorized up to $100 million in direct assistance and additional indirect assistance (exclusive of end capital items) up to a total of 50 percent of the capital cost of a utility-owned LMFBR demonstration plant.

July 25, 1973, Contracts for LMFBR demonstration signed—Utilities agreed to provide $254 million, a site, and additional services to the demonstration project. AEC agreed to provide all additional funding for the estimated $699 million project. PMC established to control the assets and manage the project under joint utility and AEC direction.

February 1975—Estimated project costs escalate to $1.736 billion. Private sector pledges estimated at $268 million.

Dec. 31, 1975, P.L. 94-187—Government funding for the demonstration project put on a yearly basis with no overall (e.g. 50% of capital cost) spending limit. JCAE empowered to approve new program criteria with increased ERDA participation. ERDA ownership of the plant authorized.

May 4, 1976, New project contracts signed—Ownership of the facility and overall project management shifted from PMC to ERDA.

Aug. 1, 1983—$1.5 billion of total estimated project cost of $3.9 billion spent. $150 million of total estimated private contribution of $325 million received. Plan for additional private sector participation under development by DOE. ●

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Senate

THE CLINCH RIVER BREEDER REACTOR

● Mr. HUMPHREY. Mr. President, yesterday a major debate sponsored by the Heritage Foundation was held in the Longworth Building on whether or not the Clinch River breeder reactor should be funded. Over 120 people attended and the debate was quite lively. Indeed, I only wish the debate could have been held here before the entire Senate.

Even though the Heritage Foundation has come out against Clinch River, the forum was balanced and fair. Making the case for Clinch River was Dr. David Rossin of the Electric Power Research Institute, a long-time proponent of Clinch River who previously worked at Commonwealth Edison of Illinois—the main contracting utility for the project. Joining him was Mr. Gordon Chipman, the breeder program's director at the Department of Energy and man with Hill experience as a technical adviser to Congresswoman MARILYN BOUQUARD on the House Science and Technology Committee.

On the side opposing Clinch River was Republican Congressman VIN WEBER of Minnesota and Dr. Brian G. Chow, a physicist and doctor of finance, formerly with the American Enterprise institute. Dr. Chow authored the American Enterprise Institute study the "Liquid Metal Fast Breeder Reactor: An Economic Analysis," and is now a senior research analyst with Pan Heuristics, a defense and energy research firm based in Los Angeles. Three important points emerged from the debate.

The first of these was that Clinch River will cost far more than DOE's latest estimate of $3.57 billion. Indeed, both sides made it clear that building the reactor is just the beginning. In specific, billions more must yet be spent on the infrastructure necessary to provide Clinch River with the plutonium fuel it needs. Back in 1971 keeping these fuel cycle costs out of the Clinch River estimate seemed sensible; everyone assumed that plutonium fuel and breeders would be so economical that private industry alone could provide these services and make a profit. Yet, both sides agreed that no one yet knew when breeder reactors would be more economical than existing light water reactors. They also agreed that Clinch River meant very little as a breeder demonstration project unless it was immediately followed by an even more expensive scaled-up version of the plant, which DOE in fact is now planning to fund for next year.

The second point that surfaced during the debate was that as a demonstration plant, Clinch River might give us hands-on engineering experience relating to its own construction and operation but that advanced breeder research and development—what is needed to devise a more economical breeder—is hardly Clinch River's objective. Indeed, as one exchange made clear, building Clinch River now has as much to do with advancing an economical breeder as building the French Concorde had with advancing an economical supersonic transport: The thing might fly—which no one ever doubted—but this knowledge will not make it any more economical nor provide us with the kind of research and development necessary to design one that is. DOE has a distinct breeder research and development program. It is funded separately from Clinch River at over $300 million a year. It features its own experimental breeder and a new breeder test facility and advanced design data comes from it, not Clinch River.

The last point that the debate raised and upon which both sides agreed, is that more advanced breeder designs than Clinch River are clearly available—one specific one by Westinghouse was discussed. Yet, the proponents of Clinch River argued that Clinch River should still be built to keep DOE's breeder efforts from loosing momentum and to provide insurance against the outside chance that we will need a commercial breeder (even this design) decades before others predict.

As many of you know from my fight last year against Clinch River I find these later arguments most unpersuasive. Of the people now working on Clinch River almost all have engineering and metallurgical skills that could be used more profitably elsewhere. More important, Clinch River and near-term commercial breeders in general are a losing proposition against light water reactors and will remain so for some time.

Dr. Chow did an excellent job in explicaiting this point in yesterday's debate Mr. President. The paper he presented at yesterday's debate is both brief and clear in its explanation of the economic problems facing Clinch River. I ask that the complete text of this paper be printed in the RECORD.

The paper follows:

WHY WE SHOULD NOT FUND THE CLINCH RIVER BREEDER REACTOR

(By Brian G. Chow)

Ever since the discovery of nuclear fission in the late 30's, scientists have been fascinated by the idea of a nuclear breeder which offers the potential for an essentially inexhaustible supply of energy. This fascination is at the heart of breeder enthusiasm, although, in time, other arguments have been put forth to support the breeder. However, the timing of the introduction of a new technology is governed more by its economic competitiveness than its abundance. For the same reason, we have not yet massively deployed other inexhaustible or essentially inexhaustible energy resources such as solar energy and seawater uranium.

Until recently, energy planners in the United States and abroad consistently overestimated future nuclear plant capacity and underestimated uranium resources. These estimates, coupled with overoptimistic projection of breeder plant capital and fuel cycle costs, led to the false conclusion that the need for breeders is urgent. It was under such a sense of urgency that, in 1972, President Nixon committed the federal government to build the Clinch River Breeder Reactor (CRBR) as a joint demonstration project with the electric utilities. It was considered then that the breeder would be commercialized as early as the year 1985.[1]

What has happened since 1972? The projection of U.S. nuclear plant capacity installed in the year 2000 has dropped by a factor of seven and that in the year 2020 by a factor of twelve.[2] Nuclear projections in other countries have also declined drastically. Instead of a shortage in uranium supply we now have a glut. It will not disappear soon and the Congress is now deliberating a bill to limit the uranium imports. The glut is caused not only by a reduction in uranium demand resulting from the drastic cutback in nuclear plant construction, but also by an increase in uranium supply. During the last decade, a number of geological settings which contain large economic quantities of uranium have been discovered in various places over the globe. This has greatly expanded the uranium resource base. On the other hand, the estimated reprocessing cost in real terms for the breeder fuel has jumped by a factor of four.[3] The construction cost of a breeder was thought to be $250/kwe[4] more costly than a current reactor (a lightwater reactor (LWR)) and, by the year 2006, the cost will be the same "via the economies of scale associated with a size change, and also via the classical learning effect."[5] In the latest DOE projection, it is apparent that the CRBR design will not bring the breeder construction cost near that of a current reactor—a matured breeder is estimated at $1035/kwe more.[6] In fact, since the CRBR decision in 1972, it is hard to find any key cost component that has changed in the direction more favorable to the breeder.

How do we assess the breeder in light of these significant changes? A commercial breeder will not be economically competitive with the current type reactor even with only a modest improvement of 15 percent in uranium efficiency, until the price rises to $210/lb U_3O_8,[7] which is eleven times the current uranium spot price of $18.5/lb U_3O_8,[8] and more than twice the $95/lb U_3O_8 figure projected by the Department of Energy's own Energy Information Administration for the year 2020.[9] The breeder is not expected to be economical until after the year 2040 or about sixty years from now. It is far too early to build a breeder demonstrator now.

One very noticeable evidence of the deteriorated breeder economics is the absence of a cost-benefit analysis in the recently released environmental impact statement of the U.S. fast breeder reactor program.[10] In the earlier statements, a cost-benefit analysis was presented and a large breeder benefit was claimed in no uncertain terms. Now, the breeder proponents prefer to argue that the future is uncertain and the breeder option should be developed as soon as possible for insurance purposes. One should note that the fuel cost in an improved light-water reactor is less than 10 percent of the electricity delivered price for a uranium price of up to $200/lb U_3O_8, and the key advantage of a breeder is savings in fuel cost.[11] Even if the future turns out unexpectedly and extremely favorable to the breeder, the worst that can happen to the consumers is to pay a higher price for the uranium which is only a small component of the electricity price. If we adopt a ten year delayed breeder demonstration strategy, the consumers, at worst, are to pay an electricity price higher by no more than one percent during the 1982-2050 period.[12] This is hardly unbearable and its probability of occurrence is very low.

Let us evaluate the insurance argument from the perspective of uranium supply adequacy. In the latest EIA forecasts, four nuclear capacity projections are made. Since we are interested in the unlikely event which is most favorable to the breeder, we select the highest projection of the four.[13] By the same token, let us use the domestic reserves and only those resources with 95 percent high confidence; both estimated by the Department of Energy.[14] If the highest projected nuclear capacity is exclusively supported by the light-water reactors with improvements but without breeders, we still have enough uranium to supply the lifetime requirement of all these reactors built on or before the year 2030. Therefore, there is no urgency now to build the CRBR even for insurance purposes. Let me emphasize that we have not yet included those probable resources of lower confidence level nor those possible and speculative resources of any confidence level. In fact, if the DOE's estimated mean or expected amount of uranium, instead of the high confident amount, is assumed to be available, we have enough uranium to support even DOE's highest projected nuclear capacity without breeder participation until the year 2055.

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[1] Footnotes at end of article.

Moreover, the taxpayers would have to pay well beyond the additional $2.3 billion to complete the CRBR. First, pioneer energy projects are prone to cost overruns.[15] Second, we will not be asked to support the CRBR alone. Fund requests for a large breeder demonstrator as a CRBR follow-on have already appeared in the FY 1984 budget proposal. We will be told to support the reprocessing, fabrication and other breeder fuel cycle facilities. We will be told that we will need all these and more in order to have in place the infrastructure of engineering, industrial and licensing experience. Since the economic breeder will not appear until far into the future, to support the breeder program as proposed by the breeder proponents will cost us handsomely and indefinitely. The total cost will likely be closer to $10 billion than to $2.3 billion. There exist more cost-effective investments such as research, development and demonstrations of improvements in the present type reactors. Because some of these improvements are retrofittable and all are based on existing reactor technology, they will penetrate the market faster than the breeder, and produce larger and quicker electricity cost savings. It is important to note that opposition to the CRBR in no way implies opposition to nuclear energy in general. It seems that at present the nuclear market is so blight that the nuclear industry fears that saying anything against its long-endorsed reprocessing and breeder would put the nuclear market in further jeopardy. Quite the contrary, concentrating our resources on the improvements of current reactors which are in trouble and in need of reviving would help the nuclear industry much more than expanding our efforts on the uneconomical breeder.

Most of the breeder demonstrators and associated facilities in various countries were planned when breeder economics was anticipated to be favorable. Since substantial investments were made, an alliance was formed among groups with vested interests—some people from the nuclear industry, utilities, bureaucracy, and politics. They will continue to advocate the breeder program. But their momentum is being slowed by reality. In fact, even the French, who are the most ardent breeder supporters, no longer expect their breeder to be economical. Using France's own estimate of the plant capital cost of their "target" commercial breeder,[16] we found that it still will not be economically competitive with a 15 percent-improved light-water reactor[17] until the uranium price reaches about $300/lb U_3O_8, sixteen times the current uranium spot price and three times the EIA's projected price for the year 2020.

In sum, the CRBR was committed a decade ago under a false sense of urgency—that the uranium would soon be running out, and that the breeder construction cost would be brought down to close to that of the light-water reactor or that the uranium price would be so high that even a breeder with a substantial higher construction cost would still produce electricity at a cost no higher than that of a light-water reactor. None of these turns out to be the case. Breeder reactors based on the CRBR design will not be economical even after many units are built. Lately, Westinghouse and Burns and Roe, Inc. have proposed a new design which is drastically different from that of the CRBR, so as to have the potential of reducing significantly the breeder construction cost.[18] Whether such a design is workable remains to be seen. The message, however, is clear. We must seek alternative designs to produce an eventual economic breeder. The CRBR demonstrator cannot test these designs. For example, the Westinghouse/Burns new design calls for sodium pipe bellows, individual containment cells, primary piping nozzles in the deck instead of at the reactor vessel. Obviously, these design changes cannot be made or tested in CRBR. It is simply premature to build a demonstrator when the design remains to be determined. Other countries with breeder programs are facing the same problem. Factors affecting breeder economics have fundamentally changed over the last ten years. We have no choice but to alter our planned programs accordingly. If we proceed along the old path, the CRBR project and other breeder related projects will cost us dearly year after year for a long period of time. And, they will divert our resources from more worthy projects, such as the improvements of current nuclear reactors, and the testing of new designs and components that would have a chance leading to an economical and desirable breeder.

FOOTNOTES

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[1] U.S. Atomic Energy Commission, Proposed Final Environment Statement, Liquid Metal Fast Breeder Reactor Program, WASH-1535, (December 1974), Vol. 4, p. 11.2-33.

[2] Ibid., p. 11.2-113 and Energy Information Administration, Department of Energy, 1981 Annual Report to Congress, Volume 3: Energy Projections, February 1982, p. 110.

[3] U.S. Atomic Energy Commission, Proposed Final Statement, op. cit., p. 11.2-97, and U.S. Department of Energy, Nuclear Proliferation and Civilian Nuclear Power, Report of the Nonproliferation Alternative Systems Assessment Program, Volume 5, June 1980, p. 77.

[4] All figures here have been expressed in first quarter 1982 dollars by GNP implicit price deflator, unless explicity stated otherwise.

[5] U.S. Energy Research and Development Administration, Final Environmental Statement, Liquid Metal Fast Breeder Reactor Program, ERDA-1535, ERDA, Washington, D.C. December 1975, p. III, F-[illegible]

[6] Energy Information Administration, Department of Energy, 1980 Annual Report to Congress, Volume 3: Forecasts, p. 287. The capital costs have been normalized to a 70 percent capacity factor.

[7] Brian G. Chow, "Reprocessing: An Uneconomic and Risky Venture," prepared testimony before the Subcommittee on International Economic Policy and Trade and the Subcommittee on International Security and Scientific Affairs, of the Committee on Foreign Affairs, August 10, 1982, p. 6.

[8] Nukem's uranium price (August 1982) is $18 to $19/lb U_3O_8 in current dollars. Nuclear Fuel, August 16, 1982, p. 13.

[9] Energy Information Administration, Department of Energy, 1980 Annual Report to Congress, op. cit., p. 177.

[10] U.S. Department of Energy, Final Environment Impact Statement, Liquid Metal Fast Breeder Reactor's Program, DOE/EIS-0085-FS, May 1982.

[11] The breeder's fuel cycle cost, however, is by means low because of reprocessing cost and much higher fabrication cost.

[12] More precisely, this is less than one percent of the total lifetime electricity delivered and discounted cost for all electricity generating power plants coming on line during the 1982-2060 period. Brian G. Chow, Timing of Breeder Demonstrations: An Economic Analysis, (Marina del Rey, California: Pan Heuristics, R&D Associates), prepared for the U.S. Arms Control and Disarmament Agency, March 16, 1981, p. 1.

[13] Energy Information Administration, 1981 Report, op. cit., Vol. 3., p. 110.

[14] Department of Energy, "Statistical Data of the Uranium Industry," GJO-100(81), January 1, 1981. Uranium is classified into two categories—reserves and resources. The resources are further classified into probable, possible and speculative resources. The 95th percentile implies a 95 percent confidence in the existence of at least the amount shown.

[15] These projects average 100 percent cost overruns. Edward W. Merrow, Kenneth E. Phillips and Christopher W. Myers, Understanding Cost Growth and Performance Shortfalls in Pioneer Process Plants (Santa Monica: Rand Corporation), 1981.

[16] "Fast Reactor Hearings for European Politicians," Nuclear News, February 1980, p. 45.

[17] In the current once-through mode where the fuel is used only once.

[18] W. H. Arnold, General Manager, Advanced Reactor Division and J. E. Sharbaugh, Fellow Engineer, of Westinghouse Electric Corporation, and W. H. Young, Vice President and C. S. Ehrman, Manager, Advanced Breeder Development, of Breeder Reactors Division, Burns and Roe, Inc., "Approach to Achieve Competitive LMFBR Capital Cost," 1982.

United States
of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 97th CONGRESS, SECOND SESSION

Vol. 128 WASHINGTON, WEDNESDAY, SEPTEMBER 29, 1982 *No. 132*

Senate

Mr. HUMPHREY. Mr. President, in the interest of time, and I am aware as is Senator Bumpers that time is of the essence this morning, I will be brief in my remarks. I think Senators have heard the arguments before, but the high points bear reiteration.

First of all, this is not an antinuclear amendment. The Senator from New Hampshire supports nuclear power. The issue under discussion and consideration this morning is the issue of waste. I am not talking about nuclear waste; I am talking about waste of money, waste of taxpayer's money.

The Clinch River breeder demonstration project is involved in a stupendous cost overrun. It was originally estimated to cost $600 million, which is no small piece of change in itself, but today after six reestimates on the part of the Department of Energy and predecessor agencies, the cost is estimated to be $3.6 billion, an additional $3 billion. To make matters worse, the General Accounting Office in a report issued just last week indicates that the true costs, including interest expense to the taxpayers, are really much closer to $9 billion—$9 billion for one plant.

It is bad enough that the program has suffered such a huge cost overrun, but to make matters worse we do not even need it. We do not need this demonstration project for the reason that we have something better in the way of nuclear technology. And just what is that? Namely, light water reactors of the kind being used today.

Even by the Department of Energy's own studies, breeder reactors will be unable to compete economically with light water reactors for decades to come, in other words, until well after the turn of the century, the time frame of 2020 to 2030.

The chief advantage of breeder reactors, of course, is that they create their own fuel. But it happens that fuel costs are a very small part of the lifetime cost of the nuclear plant. The capital costs of breeder reactors are very much higher and because uranium is relatively inexpensive and abundant and is forecast to be abundant and relatively inexpensive for several more decades, light water reactors, the kind of reactors we are using today, are much more economical.

Mr. President, no utility in this country is going to commercialize breeder reactors in this century; therefore, it makes no sense for us to be building a demonstration project.

Historically, demonstration projects have been built when a technology is on the threshold of commercialization. But this one is not. It is decades away from commercialization and it makes no sense for us to continue with this project. Even the utilities themselves in a way have acknowledged this. Originally, they agreed to participate and to share the cost with the taxpayers 50-50. They long ago pulled out of that agreement. Their total participation so far has been something on the order of 4 or 5 percent and they intend to make no further contribution.

So they are not willing to invest their money. Why should Congress invest the money of our taxpayers in this project which makes no economic sense and which has suffered such a huge cost overrun?

Mr. President, I believe at this point I will yield to ny colleague from Arkansas and I may wish to raise a few other points after he has spoken but if he is ready I will yield the floor at this time.

United States of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 97th CONGRESS, SECOND SESSION

Vol. 128 WASHINGTON, TUESDAY, NOVEMBER 30, 1982 *No. 137*

Senate

CLINCH RIVER—A NET LOSS

● Mr. HUMPHREY. Mr. President, proponents of the Clinch River breeder reactor (CRBR) project, estimated to cost nearly $9 billion by the General Accounting Office (GAO), claim the controversial project will generate anywhere from $8 to $20 billion in revenues from sale of electricity. This estimate is contained, for instance, in a report of the House Appropriations Committee in its energy and water development appropriations bill report. The report states that:

> On a straight profit and loss basis, reasonable estimates of the value of CRBR's electricity over the cost to complete the project, would show a net return of about $9 billion while fulfilling the project's objectives as a research, development and demonstration activity.

Proponents of Clinch are wrong about profitability. What the House Appropriations Committee report neglects to mention is that this $9 billion net return is really an estimate of Clinch River's gross revenues in year-of-receipt dollars. This net return is bloated by inflation and fails to consider expenses of financing, construction, and operation and maintenance. When these additional costs are considered, at best the real value of Clinch River's net operating revenues turns out to be one-fifth of what proponents claim.

A Congressional Research Service (CRS) study I am releasing today drives this point home: After deflating these revenues into 1982 dollars and applying the discount rate the Tennessee Valley Authority (TVA)—the anticipated purchasers of Clinch—would use to calculate the cost of buying the plant, CRS concludes that the range of gross revenues from Clinch River over its 30-year lifetime is between $0.76 billion—assuming a discount rate that the Office of Management and Budget now uses—to $2.6 billion, without any discount rate. CRS also estimates Clinch River's net operating revenues, or gross revenues minus the costs of operating and maintaining the reactor, to be between one half to two-thirds of gross revenues. I calculate that figure to be approximately $0.38 to $1.72 billion.

The Department of Energy, another Clinch proponent, sets Clinch River's total cost at $3.6 billion, or $5.2 billion less than GAO. Using DOE's total cost estimate, it is easy to see that net revenues—what would be left after subtracting the costs of financing, construction, and operation and maintenance—are nonexistent.

Even the most optimistic estimates of Clinch River's anticipated net operating revenues are minimal. A June 1981 estimate by the Tennessee Valley Authority of Clinch's expected revenues, after subtracting operating and maintenance, shows that Clinch River would only produce $542.4 million and are based on four optimistic assumptions: First, that Clinch would operate at 80 percent of its designated capacity compared to the industry norm of 65 percent; second, that Clinch's capacity, unlike other reactors, would not decl~~ine; third~~, that TVA would pay more than what they are obligated to pay for Clinch's electricity, and fourth, that reprocessing Clinch's fuel, requiring the construction of a $1 billion plant, will cost nothing.

Other Government studies now underway are more pessimistic, suggesting that Clinch River's net operating revenues, after subtracting operation and maintenance costs, to be nonexistent. The GAO is currently completing a study that concludes there will be no net revenues from Clinch River. Even after accruing revenues from the sale of electricity, the operators of the Clinch River breeder reactor, according to GAO, will be in red ink to the tune of $3 billion due to high operation and maintenance costs.

Given these considerations, it is difficult to imagine that TVA, which already has a large surplus of nuclear generating capacity, would be willing to buy or operate Clinch River. Indeed, there is good reason to doubt that TVA is willing to buy the plant at all. And, if TVA refuses to buy the Clinch River breeder reactor project, the Federal Government will be forced to decide either to operate the plant or to cut its losses and mothball the facility.

These points are important and should be considered before we vote on whether to continue the current lameduck session. Certainly, Congress should benefit from the same information used by the Department of Energy to determine Clinch's net revenues. Since this information, contained in the aforementioned TVA study, was conducted for the current Washington director of the breeder project, and since the CRS study corroborates its findings, I ask that the complete text of both studies be printed in the RECORD.

The material follows:

JUNE 5, 1981.

Mr. GORDON CHIPMAN,
Room B, Rayburn House Office Building
Washington, D.C.

DEAR MR. CHIPMAN: In response to your request for a determination of the "plant life revenues" of the Clinch River Breeder Reactor, we have prepared the following information.

Based on a 30-year life and beginning operation in 1990, the plant has been evaluated using the energy output levels provided us and listed below:

	Megawatt years
1990	146.25
1991	187.5
1992	225.0
1993–2020	281.25

We have also included the operating costs of $544.5 million in the first five years of operation which were provided to us. Beyond the fifth year, we have used $26.5 million (fuel) and $15.0 million operation and maintenance expenses as provided to us. We have escalated these values at the appropriate escalation rate of 9.7 percent for fuel and 11.5 percent for operation and maintenance costs.

The enclosed table provides the detailed calculations in determining this plant life revenue. Since we do not estimate rates beyond 2000, general trends were observed to determine the level of wholesale rates beyond that year.

Using the 14¾ percent discount rate you requested, the 30-year net worth of generation from the Clinch River Breeder Reactor is approximately $542 million (1981 dollars). For the initial five-year period of operation this value is approximately $63 million.

It should be noted that present contractual arrangements call for purchase of power from the Clinch River Project at the cost of generation displaced on the TVA system. This rate is generally lower than the wholesale rate.

If you have further questions, please let us know.

Sincerely,

LYNN C. MAXWELL,
Chief, Power Planning Staff,
Tennessee Valley Authority.

CONGRESSIONAL RESEARCH SERVICE,
THE LIBRARY OF CONGRESS,
Washington, D.C., October 26, 1982.

Attention: Henry Sokolski.
To: Hon. Gordon J. Humphrey.
From: Robert L. Civiak, Analyst in Energy Technology, Science Policy Research Division.
Subject: Clinch River Breeder Reactor Revenues.

In response to your request, enclosed is a report on the projected revenues from the sale of electricity from the Clinch River Breeder Reactor (CRBR). This report expands upon a September 27 memorandum that I prepared for you on CRBR revenues.

We hope you will find this useful. Please call if we can be of further assistance (237-7055).

PROJECTED REVENUES FROM THE CLINCH RIVER BREEDER REACTOR

There is considerable debate in Congress over whether to continue funding for the controversial Clinch River Breeder Reactor (CRBR). One issue of contention is the amount of gross revenue that can be expected to be received from the sale of the electricity produced by the plant. This report shows that dramatically different estimates of CRBR gross revenues—$769 million to $19.2 billion over 30 years—are within the realm of possibility depending upon the assumptions used. It should be emphasized that the above figures are for gross revenues. Net revenues are even less certain, but would be considerably lower. Net operating revenues would be gross revenues minus fuel, operating, and maintenance costs. Net revenues would be net operating revenues minus capital costs.

In order to project CRBR revenues, one must estimate a rate for the sale of a kilowatt hour (kw-hr) of electricity, what percentage of its maximum output the plant will produce (capacity factor), the future rate of inflation, and any possible deviation of electricity rates from the general inflation rate. Different estimates of these variables contribute to the variance between projections of CRBR gross revenues. However, perhaps the greatest variance comes from different assumptions about the discount rate to apply to future revenues[1] and from presenting the revenues in terms of dollars of different value (i.e., different base years). In this report mid-range values for the first four variables are assumed; CRBR gross revenues are then calculated for a wide range of discount rates and base year dollars, and the results compared.

Gross revenues are projected both for the first 5 years of CRBR operation and for the full 30-year expected life of the plant. The revenues during the first 5 years are significant, because according to current contracts for the construction and operation of the plant the gross revenues are to be returned to the U.S. Treasury.[2] At the end of 5 years the Tennessee Valley Administration (TVA) may buy the plant from the Government. While this means that revenues received after the first 5 years may not be returned to the Treasury, the value of CRBR at the time of the sale may depend upon the expected net operating revenues, which are of course substantially less than the gross revenues.

Assumptions

In the revenue projections presented below it is assumed that CRBR begins operation in 1989, as currently planned by the Department of Energy (DOE), and that it operates at its 350 megawatt design capacity for the full 30 year design lifetime.

The general inflation rate used in the projections is 8.0 percent, which is the rate that DOE uses in estimating the cost to build

Year	Operating value			Operating costs (millions)			Net Value (millions)	Present worth of net value [3]
	Wholesale rate [1]	Generation [2]	Operating benefits (millions)	Fuel	O&M	Total		
1990	73.7	1.281	$94.4			$108.9	−$14.5	$4.3
1991	80.2	1.643	131.8			108.9	22.9	5.0
1992	86.0	1.971	169.5			108.9	60.6	13.8
1993	92.2	2.464	227.2			108.8	118.3	23.6
1994	99.1	2.464	244.7			108.9	135.3	27.6
1995	106.8	2.464	263.2	$26.5	$15.0	41.5	221.5	31.8
1996	115.2	2.464	283.9	29.1	16.7	45.8	238.1	31.8
1997	123.4	2.464	304.1	31.9	18.6	50.5	253.6	29.6
1998	132.6	2.464	326.7	35.0	20.8	55.8	270.9	27.6
1999	142.6	2.464	351.4	38.4	23.2	61.6	289.8	25.8
2000	153.7	2.464	378.7	42.1	25.9	68.0	310.7	24.2
2001	166.8	2.464	411.0	46.2	28.8	75.0	336.0	22.9
2002	181.6	2.464	447.5	50.7	32.1	82.8	364.7	21.7
2003	198.0	2.464	487.9	55.6	35.8	91.4	396.5	20.7
2004	216.3	2.464	533.0	61.0	40.0	101.0	432.0	19.7
2005	236.6	2.464	583.0	66.9	44.5	111.4	471.6	18.8
2006	259.4	2.464	639.2	73.4	49.7	123.1	516.1	18.0
2007	284.8	2.464	701.7	80.5	55.4	135.9	565.8	17.2
2008	313.3	2.464	772.0	88.3	61.8	150.1	621.9	16.6
2009	345.3	2.464	850.8	96.9	68.9	165.8	685.0	15.9
2010	379.9	2.464	936.1	106.3	76.8	183.1	757.0	15.3
2011	416.0	2.464	1,025.0	116.6	85.6	207.2	[illegible]	14.6
2012	455.5	2.464	1,122.4	127.9	95.4	223.3	899.1	14.0
2013	498.8	2.464	1,229.0	140.3	106.4	246.7	982.3	13.4
2014	546.2	2.464	1,345.8	153.9	118.7	272.6	1,073.2	12.9
2015	598.1	2.464	1,473.7	168.8	132.3	301.1	1,177.6	12.2
2016	654.9	2.464	1,613.7	185.2	147.5	332.7	1,281.0	11.6
2017	717.1	2.464	1,766.9	203.1	164.5	367.6	1,399.3	11.1
2018	785.2	2.464	1,934.7	222.8	181.4	406.2	1,528.5	10.6
2019	859.8	2.464	2,118.5	244.5	204.5	449.0	1,669.5	10.1
2020	941.5	2.464	2,319.9	268.2	228.0	496.2	1,823.7	9.7
30 year sum							19,701.8	542.4

[1] Dollars per Mega Watt hours

[2] Kilowatt hours in millions

[3] 1981 dollars at 14.38 percent

CRBR. It is further assumed that electricity prices will increase at a rate of 1 percent per year faster than inflation for the entire period studied. This latter assumption may be compared to the Energy Information Administrations projection that electricity prices will increase between 1½-2 and percent faster than inflation until 1995,[3] but at a rate of less than one-tenth of one percent per year above inflation from 2000 to 2020.[4]

According to the contract between TVA and DOE, TVA will buy the electricity produced by CRBR at a price equivalent to the cost to TVA to produce the power it replaces. Using TVA's 1981 costs, DOE estimates a rate of 3.06 cents per kw-hr in 1981 dollars as a base for projecting CRBR revenues.[5] In the projections below, an equivalent rate of 3.3 cents per kw-hr in 1982 dollars has been used.

The average capacity factors used are 60 percent for the first 5 years and 68.5 percent for the full 30 years. These compare to an average capacity factor of about 65 percent for nuclear reactors in operation in the United States over the past 5 years. It is assumed that CRBR's capacity factor will be slightly lower than the national average during its first 5 years because it is a demonstration reactor with an untried design. The 30-year average capacity factor of 68.5 percent is the same as that used by the Nuclear Regulatory Commission in its 1977 Environmental Impact Statement on CRBR.[6]

When these assumptions are combined, the estimate gross revenue from the sale of electricity produced by CRBR in its first year of operation is 350 megawatts X .60 capacity X 24 hours/day X 365 days/year X 3.3 cents/kw-hr X 1.08 [7] (for inflation) X 1.01 [7] (electricity prices),[7] which equals $111.5 million in 1989 dollars. Similarly, for a 68.5 percent capacity factor, the "base year" gross revenue is calculated to be $127.3 million in 1989 dollars.

Results

Projected gross revenues from the sale of the electricity generated by CRBR in its first 5 years of operation are given in table 1, and gross revenues for the full 30-year design life of the plant are given in table 2. Revenues are given for three different ways of valuing dollars and for four discount rates. In the first column in each table gross revenues are shown in undiscounted, year-of-receipt dollars. For this calculation, the revenue in the "nth" year of CRBR operation is taken as the revenue in the base year times $(1.08 \times 1.01)^n$. The factor of 1.08 accounts for general inflation and the factor of 1.01 is for the extra increase in electricity price above inflation.

TABLE 1.—PROJECTED GROSS REVENUES FROM THE FIRST 5 YEARS OF CRBR OPERATION

Discount rate (percent)	Gross revenues (millions of dollars)		
	Undiscounted	Discounted to 1989	
	Year of receipt (dollars)	1989 (dollars)	1982 (dollars)
0	729	[illegible]	[illegible]
3.7	729	[illegible]	[illegible]
5.6	729	484	[illegible]
10.0	729	435	254

In the second column in each table the gross revenues are calculated in 1989 dollars, discounted to 1989 (the planned first year of CRBR operation), at discount rates of 0, 3.7, 5.6 and 10.0 percent. For this column the revenue in the n th year is the base year revenue times $[(1.01)/(1+i)]^n$, where i is the relevant discount rate.[8] In this case the factor of 1.08 does not appear because the calculation is in constant 1989 dollars, but the factor of 1.01 is retained to account for the assumption that electricity prices increase faster than inflation.

In the third column in each table the gross revenues are discounted to 1989, but shown in 1982 dollars. For this column the results of column two are divided by $(1.08)^7$.

TABLE 2.—PROJECTED GROSS REVENUES FROM 30 YEARS OF OPERATION OF CRBR

Discount rate (percent)	Gross revenues (billions of dollars)		
	Undiscounted	Discounted to 1989	
	Year of receipt (dollars)	1989 (dollars)	1982 (dollars)
0	19.21	4.172	2.609
3.7	19.21	2.604	1.519
5.6	19.21	2.061	1.203
10.0	19.21	1.318	0.769

Discussion

According to table 1, the gross revenue from the sale of the electricity produced during the first five years of CRBR operation might be projected at from $254 million (1982 dollars discounted at 10 percent per year to 1989) to $729 million (year-of-receipt dollars). These two numbers differ by nearly a factor of three, but there is a much greater difference between the various ways of calculating the CRBR gross revenues over a 30-year period. The 30-year gross revenues (table 2) are projected to be from $769 million to $19.2 billion.

Depending upon the context, it might be correct to say either that the gross revenues from CRBR will be $769 million (1982 dollars discounted at 10 percent per year to 1989) or $19.2 billion (undiscounted year-of-receipt dollars). The larger figure represents the actual revenues from the sale of the electricity produced as they are received, while the smaller figure represents the value of the revenues at the time the plant will begin operation (1989) in terms (1982 dollars), which are most familiar. Great care must be taken when using these figures, however. Neither is appropriate for a comparison with the cost of building the plant.

A proper cost/benefit comparison of CRBR would compare the costs of building the plant (including interest), expressed in constant year dollars of some base year (most conveniently 1989) with the discounted net operating revenues (gross revenues minus operating and fuel costs) from its operation. Depending on the discount rate used, the discounted gross revenue from the sale of electricity is estimated (table 2) at $1.3–2.6 billion (1989 dollars) and the net operating revenues might be expected to be about 1/2 to 2/3 of the gross revenue.[9]

On the cost side, DOE estimates a total cost of $3.7 billion to build the plant in as-spent dollars, which range from 1974 dollars to 1989 dollars.[10]

The comparable cost in 1989 dollars would be considerably higher. In addition, the U.S. General Accounting Office (GAO) has estimated that the cumulative interest on the money spent to build CRBR would be another $3.9 billion (mixed 1974-1994 dollars).[11] Hence, it is clear that the net operating revenue from CRBR is expected to be considerably less than the cost to build the plant, i.e. there is projected to be a large net cost associated with building and operating CRBR rather than a net revenue.

On the other hand, CRBR was never designed to operate at a profit. Its value is as a research, development, and demonstration facility. Benefits accruing from these functions have not been included in the above oversimplified cost/benefit analysis.

APPENDIX A

The discount rate[12]

Capital spending projects in the public sector are often evaluated by a method called cost-benefit analysis. Cost-benefit analysis involves identifying and measuring the costs and benefits associated with each project.

In order to evaluate the benefits and the costs which accrue at different rates over different periods of time, their values must be stated in terms of a common reference point. This common reference point is usually, but not necessarily, the present.

The flow of costs and benefits for an investment project are discounted to their "present value" through the application of an appropriate discount rate. The application of the discount rate is much like the compounding of interest, only it is generally backwards in time instead of forward.

The present value of a quantity may be defined as $1/(1+i)^n$ times that quantity, where i is the discount rate and n is the number of years through which the quantity is being discounted. The term present value is used even if the common reference point is not the present. Present values of costs and benefits can be compared to compute the net benefit of each individual project. The problem then is to determine the appropriate discount rate.

Many economists believe that the discount rate used to evaluate Government projects should measure the opportunity cost of capital to the Government. The opportunity cost of capital is the value of the commodity which would have been produced had the capital been invested in its most productive alternative. The alternative to public investment is private investment, thus the opportunity cost of capital to the Government is the rate of return earned on productive resources in the private sector. We are still left, however, with the difficulty of measuring the rate of return on investment of the private sector of the economy.

The Office of Management and Budget (OMB) has provided some guidance in this regard. OMB Circular A-94 [13] establishes a fixed discount rate of 10 percent for all evaluations of applicable programs and projects (water projects, real property, commercial type services, and automatic data processing equipment are exempted). The Circular states that this discount rate "represents an estimate of the average rate of return on private investment, before taxes and after inflation." Hence according to OMB, the 10 percent discount rate should be used in establishing the present value of future costs and benefits expressed in constant dollars.

A 1977 Congressional Research Service investigation [14] into the question of the appropriate discount rate to be used in Government cost-benefit analysis offers another means of approximating the opportunity cost of capital to the Government. That investigation concluded that the interest rate on new long-term Government bonds is the best approximation of the opportunity cost of capital to the Government.

The interest rate on long-term Government bonds has recently been about 14 percent. However, that rate must be corrected for inflation to establish the discount rate to be used in determining the present value of future costs expressed in constant dollars. The discount rate is the absence of inflation, "i", is related to the discount rate that reflects the current bond market, "c", and the inflation rate, "e", by the following equation

$$i = 1 - (1+c)/(1+e)$$

If inflation is projected to be 8 percent, then substituting 0.08 for e and 0.14 for c gives i = 0.056, or a discount rate of 5.6 percent for use with quantities expressed in constant dollars.

Another candidate for a discount rate comes from the Technical Assessment Guide (TAG) prepared by the Electric Power Research Institute (EPRI).[15] The TAG is intended to provide "a consistent economic methodology for determining the relative cost to electric utility customers of the potential results of alternative R&D efforts." The TAG specifies a constant dollar discount rate of 3.7 percent based on EPRI's analysis of utility rates of return on their investment. It should be noted, however, that this discount rate is suggested for calculations made in an electric utility setting rather than for public sector R&D projects.

Another study of discount rates, by Econ, Inc.,[16] analyzes the choice of discount rate for long-term Federal energy R&D programs (specifically fusion energy) and finds that "the use of a 10 percent discount rate is clearly unwarranted for the evaluation of long-term projects . . . . High discount rates strongly favor the selection of short-term projects and nearly doom competing long-term projects despite the potential benefits offered." They note that the use of a 10 percent discount rate may be justified when the risks in a project are large and uncertain. However, they suggest that a discount rate in the range of 3 to 5 percent be used in the evaluation of long-term energy R&D programs when the risk is considered in the expression of the costs and benefits.

It can be seen that, while the concept of discounting may be generally accepted, there is a considerable range of discount rates suggested for use. The discount rates used in the above analysis of projected revenues from the sale of electricity produced by the Clinch River Breeder Reactor (0, 3.7, 5.6, and 10.0 percent) were chosen to span the range of suggested values.

FOOTNOTES

[1] Because receiving a dollar 10 years from now is not as desirable as receiving that dollar tomorrow (even without inflation), a technique called discounting is generally used for placing streams of revenue with different time patterns on a common basis. In the simplest terms, discounting is accomplished by dividing future revenues by a constant factor for each year in the future that they will be received. While the technique of discounting is generally accepted, there is a large variation in the discount rates that are used. Discount rates of 0, 3.7 percent, 5.6 percent, and 10.0 percent are used in this report. The choice of a discount rate is discussed in appendix A.

[2] The contracts are printed in: U.S. Congress. House. Committee on Science and Technology. Closeout Costs: Clinch River Breeder Reactor Project. Hearing, 97th Cong., 1st Sess., May 11, 1981. Washington, U.S. Govt. Print. Off., 1981. 321 p.

[3] U.S. Energy Information Administration. Annual Report to Congress. Washington, Feb. 1982. v. 3, p. 155.

[4] U.S. Energy Information Administration. Annual Report to Congress. Washington, Mar. 1981, v. 3, p. 161.

[5] Letter from Gordon L. Chipman, Jr., DOE Deputy Assistant Secretary for Breeder Reactor Programs to J. Dexter Peach, U.S. General Accounting Office, Oct. 13, 1982.

[6] U.S. Nuclear Regulatory Commission. Final Environmental Statement: Clinch River Breeder Reactor Plant. Washington, Feb. 1977. NUREG-0139. p. 10-7.

[7] The exponent in the inflation factors is 7 because there are that many years from 1982 to 1989.

[8] See Appendix A for a discussion of the methodology of discounting and the reasons for choosing different discount rates.

[9] The difference between gross revenue and net operating revenue is based upon a comparison of our $19.2 million undiscounted year-of-receipt gross revenue estimate with DOE's project operating cost of $8.5 billion in undiscounted year-as-spent dollars presented in the letter from Gordon Chipman to J. Dexter Peach, op. cit.

[10] DOE's latest official cost estimate for CRBR is $3.6 billion, but that includes about 0.1 billion credit for projected net revenues during the first 5 years of operation.

[11] U.S. General Accounting Office. Interim Report on GAO's Review of the Total Cost Estimate for the Clinch River Breeder Reactor Project. Letter of Sept. 23, 1982. EMD-81-131. Washington, 1982. p. 12.

[12] This appendix is based in part upon U.S. Library of Congress. Congressional Research Service. A Critique of an ERDA Paper—The Updated Cost-Benefit Analysis of the LMFBR. Typed Report by Alvin Kaufman et al. Washington, 1978. p. 39-40.

[13] U.S. Office of Management and Budget. Discount Rates to be Used in Evaluating Time-Distributed Costs and Benefits. OMB Circular A-94. Revised Mar. 27, 1972.

[14] U.S. Library of Congress. Congressional Research Service. Calculating Discount Rates in Benefit/Cost Valuations. An Economic Appraisal. Typed Report by Warren E. Farb et al. May 23, 1977. Washington, 1977. 20 p.

[15] Electric Power Research Institute. Technical Assessment Guide. EPRI, Palo Alto, Calif. May 1982. EPRI P-2410-SR.

[16] Econ, Inc. Methods of Economic Analysis Applied to Fusion Research: Discount Rate Determination and the Fossil Fuel Price Effect. Prepared for the Department of Energy, Division of Magnetic Fusion Energy. Sept. 25, 1978. 169 p. DOE Rept. C00/4181-2; Econ Rept. 78-159-2 ●

United States
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PROCEEDINGS AND DEBATES OF THE 97th CONGRESS, SECOND SESSION

Vol. 128 WASHINGTON, THURSDAY, DECEMBER 2, 1982 No. 139

Senate

FAST REACTORS ON SLOW TRACK

● Mr. **HUMPHREY**. Mr. President, one of the key arguments now being used by the backers of the Clinch River breeder reactor project is that we must build this plant if we are to stay in the international breeder reactor sweepstakes. What this presumes, of course, it that there truly is a major race effort to produce a commercially viable breeder and that it is moving so fast that building Clinch River is our best chance to stay in contention.

The following detailed article by David Dickson of Science suggests that this line of reasoning is in fundamental error, that the race abroad has slowed to a crawl, and that, indeed, in the case of the French program, it may well be the military that will have to pull their effort's financial coals out of the fire.

This article is the most recent and detailed description of European efforts in the breeder field and puts our own breeder effort into perspective. I ask that the entire text be printed into the RECORD.

The article follows:

[From Science, Dec. 10, 1982]

EUROPE'S FAST BREEDERS MOVE TO A SLOW TRACK

(By David Dickson)

PARIS.—Europe's enthusiasm for fast breeder nuclear reactors is rapidly running out of steam, faced with increased costs, decreased projections of electricity needs, and across-the-board delays in the construction of conventional light water reactors on which a commercially viable fast breeder program would depend.

In both Britain and West Germany there is now serious talk, if not of abandoning fast breeder development completely, at least of putting a freeze on expansion plans until future needs can be perceived more clearly. Nigel Lawson, Britain's minister of energy, told Parliament on 29 November that the British government remains committed to the long-term development of fast breeder reactors, but that commercial orders for fast reactors are not expected until after the year 2000.

In France, President François Mitterrand has not so far invoked his preelection call for a temporary halt in the construction of France's technological jewel, the Super-Phénix fast breeder reactor at Creys-Malville in the Rhône valley. This has stimulated concern that pressure to retain the breeder may be coming from the French military, attracted by the high-grade plutonium that will become available from the reactor blanket (see box). However, the government announced earlier this year that it was reducing its future commitment from five to one more fast reactor after Super-Phénix, and there are doubts about whether it will decide to go even this far, at least without considerably more international support.

It is all very different from the heady enthusiasm that existed up to the end of the 1970's. Even 2 years ago, at the time of the International Nuclear Fuel Cycle Evaluation (INFCE) studies, the talk was of having 50 gigawatts of breeder reactor capacity worldwide by the year 2000. Today, many economists claim breeders will not be competitive with light water reactors for the next 50 years. Even the more optimistic, such as Georges Vendreyes, head of industrial applications of nuclear energy at France's Commissariat à l'Energie Atomique (CEA), admit that breeders are not likely to become commercially attractive until the beginning of the next century.

Confidence in the technical potential of fast breeders as an eventual important energy source remains high, particularly in countries that lack access to domestic energy resources and are reluctant to accept the implications of heavy dependence on foreign supplies of uranium.

Political enthusiasm, however, has cooled, for the OPEC-inspired oil price rises have provoked a steady decline in the rate of growth of electricity demand. This, combined with licensing restrictions imposed by public concern about safety, has caused delays in conventional nuclear programs to such an extent that the date at which they would be able to sustain a viable fast breeder program, based on reprocessed light water reactor spent fuel, is receding further and further into the distance.

Furthermore, the resultant decreased demand for natural uranium is making it increasingly difficult to argue that fast breeders are urgently needed to compensate for an imminent evaporation of uranium supplies. "There now seems to be enough uranium at least until the first decade of the next century, so that the need for the breeder from the supply side is rapidly diminishing," says one analyst with the nuclear energy agency in Paris. "The long-term need for the breeder is still there; but compared to the thinking at the time of INFCE, the prospects have been put back by 20 to 30 years."

The changed economic and political climate has affected European countries in different ways, depending on the stage of their breeder programs. France, still out at the head of the pack with the world's first commercial fast breeder, the 1200-megawatt sodium-cooled Super-Phénix, is in an easier position than some. Completion of Super-Phénix is currently scheduled for 1984, and no decisions about the next step (currently thought of as Super-Phénix II) need be made until at least 1 or 2 years later.

When it comes, however, the decision will not be easy. Until recently, the future of fast breeders in France seemed well assured. The prototype Phénix, a 250-megawatt reactor, has been providing power for the French utility Electricité de France (EDF) since 1973, and most of the technical questions about fast breeder operations seem to have been solved. Furthermore, French politicians have proudly displayed fast breeders as one technology in which the country is well ahead of its international competitors.

Various factors, however, have dampened some of the enthusiasm. After 8 years of "working like clockwork," in the words of Vendreyes, Phénix sprang a leak in April of this year in its cooling system, leading to a fire when the sodium came in contact with the air. The accident put the reactor out of operation for several weeks and stimulated a debate about fast breeder safety.

Furthermore, the cost of Super-Phénix, jointly financed with German and Italian partners, has been rising alarmingly. Estimated 5 years ago to cost 4 billion francs ($550 million at current exchange rates), the latest estimate is that it will cost about 12 billion francs ($1.7 billion). Even allowing for the first-time costs of a new enginering enterprise, this means that a commercial fast breeder based on the Super-Phénix design would cost about twice as much as a conventional light water reactor of the same size.

A third factor, perhaps even less predictable, is politics. During his election campaign in 1980, Mitterand's apparently skeptical stance toward fast breeders helped him secure support not merely from the environmental movement—to whom the whole idea of a plutonium economy remains a can of worms—but also from members of the powerful union the Confédération Française Démocratique de Travailleurs, which has been waging various well-publicized campaigns around nuclear safety issues, such as the safety of working conditions for its members at the La Hague reprocessing plant.

Since his election, Mitterrand has backpedaled in his previous criticisms of the nuclear industry, well aware that for other sectors of the labor movement, it represents an important source of jobs. Work on Super-Phénix has continued virtually uninterrupted; last year, for example, Prime Minister Pierre Mauroy underlined the government commitment to fast breeders by announcing plans to expand La Hague with a facility to produce plutonium for Super-Phénix.

By announcing that no political decision will be made about the future of the French fast breeder program until operating experience has been gained with the Super-Phénix, Mitterrand has been able to keep the lid on what could become a damaging political conflict between different groups of his supporters. But, fueled on the one hand by unfavorable economic conditions and on the other by concerns that breeders could become a principal source of plutonium for France's force de frappe, the tensions are not far beneath the surface.

The situation is more delicate in Germany, which is still struggling to complete construction of its own prototype reactor, the 300-megawatt sodium-cooled test reactor SNR-300 at Kalkar, which started in 1973. This is being built by the consortium Schnell-Brüter-Kernkraftwerksgesellschaft (SBK), headed by Germany's largest utility Rheinisch - Westfalisches - Elektrivitatswerk (RWE). Belgium and the Netherlands are each contributing 15 percent of the cost and Britain's Central Electricity Generating Board 2 percent. Of the German share, electric utilities agreed to absorb 8 percent of the construction costs, the rest being covered by the federal government.

When originally planned, Kalkar was expected to be ready by 1978. It now looks as if completion will not be until at least 1986; and if the German government is unable or unwilling to raise the necessary finance, either from its own resources or from utility and nuclear construction companies, final completion could still be postponed indefinitely.

Various factors have contributed to the delay. For example, the reactor has had to go through a lengthy and detailed series of licensing procedures, which themselves have become increasingly more strict in response to growing public concerns about the safety of nuclear power. In addition, there have been various design changes, some the result of new licensing requirements, others of miscalculations in the original plans.

Each of these factors has helped increase the costs. At the beginning of the 1970's, it was estimated that Kalkar would cost 1.355 billion marks ($550 million at current exchange rates), but this projection rose steadily during the decade. In February 1981 new estimates were made public that the completion of Kalkar would cost 5 billion marks. A lengthy series of negotiations followed, during which the utilities and the nuclear industry agreed to share the extra costs with the government—but only provided that the federal parliament give the full project its approval.

This goal was almost reached earlier this fall. After 3 years of discussions, a special parliamentary commission of inquiry agreed by a narrow majority to recommend to the parliament that the construction of Kalkar should be completed and the reactor be allowed to start operation. A parliamentary debate now scheduled for 3 December had been expected to endorse the commission's recommendations with little difficulty.

Since then, two separate events have raised new doubts. With the change of government in September, the Social Democrats have closed ranks with the critics. On 24 November, the party agreed to endorse the resolution being put before parliament stating that a number of important economic and safety questions still need to be answered before Kalkar is given final approval. To some observers in Bonn, the most significant aspect of this move is that it represents the breakup of the previous all-party coalition on which support for the fast breeder has depended.

Given the extent of both public and private investments, as well as the number of construction jobs at stake, parliamentary criticism in itself is unlikely to be sufficient to halt SNR-300. However, in September, it was announced that the costs had once again been recalculated and that they were now expected to be at least 6.5 billion marks ($2.6 billion). Germany's research and technology minister, Heinz Riesenhuber, was reported last week to have written to the federation of German industrialists saying that the Bonn government does not intend to increase its contributions either to Kalkar or to another controversial nuclear project, the high temperature reactor, which has also encountered major financial problems.

Industrial sponsors of the project remain, at least in public, optimistic that the money will be found somewhere. Critics of the fast breeder, however, suggest that the new cost increases may prove to be the final death blow.

All this casts even more doubt on what was to have been the next stage in Germany's fast breeder program, the construction of a demonstration commercial reactor known as SNR-2. Roughly comparable in size to Super-Phénix this is officially planned to be jointly financed with French and Italian participants, and the final design has been virtually completed. Even the most optimistic supporters of fast breeders in Germany, however, accept that construction is unlikely to start before the end of the 1980's—"This time, we plan to get the construction license granted before we start building," says one official—and many will not be surprised if, even if Kalkar is completed, SNR-2 is put on the shelf for many years.

In Italy, doubts about current plans for fast breeder development have not taken such a public form. Italy has recently made a substantial increase in its support for all forms of energy research—including fast breeders, which now consume 39 percent of the nation's energy R & D budget—as part of its response to the energy crises of the late 1970's. However, most of Italy's support for fast breeders is going into Super-Phénix. It has agreed with France to shoulder 33 percent of the construction costs (and as a result has received orders for about one-third of the components, and will receive the same proportion of the electricity when it is produced).

Domestically, the delays in Italy's conventional nuclear program—only one full size nuclear reactor has so far been built with one more under construction—means that discussion about the need for commercial fast breeders is not even expected to begin until the mid-1990's. The most Italy is aiming for at present is to keep up with the state of the art through its contribution to Super-Phénix and the construction of its own 120-megawatt experimental fast reactor PEC (Prova Elementi Combustibili), designed to develop Italy's domestic nuclear capabilities and to study various aspects of fast reactor functioning.

Even this, however, is running into economic problems. Earlier this year, faced with the calculations that, rather than the 650 billion lire ($450 million at current exchange rates) estimated in 1980, PEC was now likely to cost 1400 billion lire ($950 million), the Italian government asked its Comission on Economic Planning to carry out an investigation of the project to determine whether it should still be supported. The commission appointed an advisory panel from the Comitato Nazionale per l'Energia Nucleare e Energie Alternativa (CNENEA), which gave the project a green light on technical grounds, and at the beginning of last week the commission itself approved the project. Officials from the CNENEA estimate that, once allowance is made for inflation, the real cost increase is only about 18 percent. Given a more stable political and economic environment, construction would probably proceed without interruption; but with the current political crisis in Italy, together with growing demands from the international banking community for broad cuts in public spending, the future of the project it still highly uncertain.

Similar uncertainty, though based on different reasons, exists in Britain. Up to now, the United Kingdom has been at the forefront of fast breeder research, with its 250-megawatt reactor in commercial operation at Dounreay in the north of Scotland since 1975, and a current research and development program costing about 110 million pounds ($136 million) a year. Britain is also working on a design for a 1300-megawatt commercial demonstration fast reactor.

In practical terms, the British government is now faced with the question of what to do next. Some observers feel that, faced with the recent weakening of economic arguments in favor of fast breeders, the answer is likely to be "wait and see." The British Conservative government faces the political challenge of bringing to fruition a program to construct ten light water reactors announced by Prime Minister Margaret Thatcher, the first of which, at Sizewell in Suffolk, is due to become the subject of a public inquiry in January. In the circumstances, an earlier government promise of an inquiry into the commercial development of fast breeders now seems a distant prospect.

Certainly, the fast breeder does not lack enthusiastic supporters in Britain (or elsewhere in Europe, for that matter), such as Walter Marshall, until recently head of the United Kingdom Atomic Energy Authority. The main British utility, the Central Electricity Generating Board (which Marshall now heads), however, basing its assessment on economic rather than technical arguments, has always been less enthusiastic. For example, it turned down an invitation to contribute toward the cost of the UKAEA financed fast breeder at Dounreay, which according to estimates by Colin Sweet of the South Bank Polytechnic in London, has a spotty operating record, reaching only 6.8 percent capacity over its first 8 years of operation.

Britain's medium-term plans for the fast breeder are currently being thrashed out in the U.K. Department of Energy. As noted earlier, substantial investment is likely to be delayed for the next 20 years.

Given the cost escalation, almost all countries agree that there is a strong case—again in principle—for the next step toward a commercial demonstration fast reactor to be taken internationally. The French, for example, have long said that they would welcome more foreign partners in the development of Super-Phenix II, a topic which is said to have been the subject of recent negotiations both the American (a possible substitute for the Clinch River liquid metal fast breeder?) and with Japan.

Again, however, the hurdles to international collaboration are high, ranging from security and legal concern about the control of plutonium, to the equitable distribution of construction contracts. Furthermore, any effort to mount an international project is seen by some critics as an attempt by nuclear supporters to evade domestic criticism. "It looks as if the breeder people are going for another Concorde syndrome, so that if they get an international treaty, it will be impossible to cancel it," says Walter Patterson of Britain's Friends of the Earth.

At the time of the INFCE studies, any decision not to proceed with a commercial program of fast breeder reactors was portrayed as a major political gamble. Today the technology has lost its imperative. As a result, proceeding with the rapid development of fast breeders, given demand uncertainties and the apparent medium-term adequacy of uranium supplies, is coming to be seen in Europe as an economic and political gamble whose outcome is unpredictable—and perhaps equally risky.

BREEDERS AND BOMBS

Questions were raised in the West German Federal Parliament, the Bundestag, last week about whether German funds are being used to help produce plutonium for French nuclear weapons. The questions were prompted by an article in the weekly magazine *Der Spiegel*, which claimed that the Super-Phenix sodium-cooled fast breeder reactor is intended to produce plutonium for the French military, and that customers of the German utility that is providing 16 percent of the funding for Super-Phénix were therefore unwittingly helping to finance the planned buildup of France's nuclear forces.

The questions were quickly dismissed by both the German and the French governments, which pointed out that the whole Super-Phénix project is being overseen by Euratom, and that this should be sufficient to ensure safeguards against the diversion of civilian plutonium to military purposes. But the incident reflects the type of political difficulty that could arise over multilateral cooperation in fast breeder research and development—difficulties that the United States has already encountered in its own nuclear cooperation agreements, most recently in its effort, though the Nuclear Nonproliferation Act, to keep a handle on the plutonium contained in the light water reactor fuel sold to other nations.

The attraction of the fast breeder, from the military point of view, is the high purity of the plutonium that can be extracted from the uranium oxide blanket after it has been bombarded with fast neutrons from the reactor core. One visitor to the United Kingdom's Atomic Energy Authority's fast breeder at Dounreay was told that the purity was as high as 98 percent. There are several cheaper and more convenient ways of producing weapons-grade plutonium; but if fast breeders are built, the temptation to the military to make use of the plutonium in the blanket will be strong.

France has never admitted that it intends to do this. Indeed, at present it has plenty of plutonium from its own military reactors. However, a veil of secrecy is generally drawn over where the country will get the plutonium it needs to fulfill future commitments to building new weapons. Nuclear critics claim they can discern from a few public statements made by those close to the military program a logic that points toward the fast breeder.

In 1973, for example, a report on the military applications of nuclear energy prepared by the Commissariat à l'Energie Atomique (CEA) recommended that the production of military nuclear material should take "advantage . . . of civilian programs . . . in order to limit the costs." In 1978 General Jean Thiry, previously director of France's military centers for nuclear testing, and subsequently an adviser to the head of the CEA, wrote that France was able to make large quantities of nuclear bombs "since fast breeders will provide ample supplies of the necessary plutonium." Most recently, an article in a weekly newsletter L'Energie stated boldly that the future supply of weapons-grade plutonium, currently produced by the aging reactor G-3 in Marcoule, was "assured" by Super-Phenix which would produce enough high quality plutonium to fuel 60 atomic bombs a year. "Super-Phénix is obviously becoming the technical base of the French force de frappe," the author, L. Lammers, an economist with Electricite de France, declared. To some critics, the message is clear. Given the declining economic interest in fast breeders as a source of electric power, they ask, what is the explanation for continued political enthusiasm? "The answer is succinct: the military needs breeders," wrote Yves Lenoire and Michel Genestout in the October issue of the popular French magazine Science et Vie, the source of Der Spiegel's broadside against West German involvement in Super-Phenix. So far, the French authorities have kept a discrete silence on the issue, other than pointing out that although it is not a signatory of the nonproliferation treaty, France is voluntarily obeying International Atomic Energy Authority safeguards on its civilian nuclear installations.

Whether the complaints are, in themselves, sufficient to deter the French, who take strong nationalistic pride in their ability to determine their own nuclear future, from moving in this direction is open to speculation ●

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Senate

BRITISH DEFER COMMERCIAL-SCALE BREEDER UNTIL NEXT CENTURY

● Mr. HUMPHREY. Mr. President, yesterday I entered into the RECORD an article describing how various European breeder reactor projects have slowed due to a lack of any urgent need to proceed and because of the technical and financial problems these projects face. We are deceiving ourselves if we think there is a major race to build a commercial breeder and that Clinch River is the best way to keep the United States in contention.

I would like to share with you today a recent U.S. State Department cable to Washington concerning the British program. This cable confirms Great Britain's recent decision to defer plans to construct a full-scale breeder demonstration plant until sometime early in the 21st century. I ask that it be placed in the RECORD.

The cable follows:

[Telegram]

DEPARTMENT OF STATE.

Tags: TNUC, ENRG, SCSA, UK.

Subject: Construction of commercial-scale fast breeder reactor to be deferred.

1. HMG announced the results of its cabinet-level review of the future of the UK's fast breeder program by the device of having the Secretary of State for Energy, Nigel Lawson, submit a written reply to a question in parliament on November 29.

2. Mr. Lawson announced that the government would continue its development of the FBR but would defer plans for construction of a full-scale plant until early in the 21st century. The decision was taken in light of reduced projections for electric power demand and the low price and relative abundance of uranium on the world market. (Heretofore, UK nuclear authorities had been planning for a public inquiry on the commercial-scale plant to begin as early as the mid-1980's, with construction to start late in the decade or in the early 1990's.)

3. The statement confirmed that the UK had been conducting exploratory discussions with other countries on the possibility of cooperative development of a large-scale reactor, and said that such talks would continue. It also announced that the current manpower level devoted to the FBR would not be reduced through forced redundancies. (This seems to leave open the possibility of manpower reductions through natural attrition.)

4. Lawson's statement was attacked from two diametrically opposite directions. Some MP's decried the decision, saying that it would lead to a brain drain of nuclear personnel who would go to other countries where more vigorous programs were being carried out. Friends of the Earth issued a statement saying, "Mr. Lawson is plunging Britain into a plutonium economy without any public mandate."

5. Comment: The decision puts the UK program plan more in line with that of the U.S. and takes the edge off of reaching an early conclusion on the nature of a cooperative effort with the U.S., France, FRG, and/or Japan. The French may be more disturbed than others by the decision, but this will not be completely clear until negotiations (which had been suspended pending the government decision) resume. Deputy Secretary of Energy Ivor Manley went to Washington on November 29 to brief Deputy Energy Secretary Davis on the decision and presumably to assure the USG that the UK intended to continue negotiations. We have not yet received any feedback from these talks.●

United States
of America

Congressional Record

PROCEEDINGS AND DEBATES OF THE 97th CONGRESS, SECOND SESSION

Vol. 128 WASHINGTON, MONDAY, DECEMBER 6, 1982 No. 141

Senate

CLINCH RIVER: DOE'S LATEST $3.3 BILLION ERROR

Mr. HUMPHREY. Mr. President, last Tuesday I entered material into the RECORD detailing how misleading the Department of Energy's recent estimates were of how much money the Clinch River breeder reactor would make once it was built. The Department of Energy claims that at least $8 to $20 billion in net operating revenues will be made from Clinch River electricity sales.

Last Wednesday, though, the General Accounting Office held a special briefing on its latest cost estimate findings and explained that once Clinch River is completed its operation may cost the taxpayers an additional $3.3 billion.

This information soon made its way to the press and the press, in turn, started to ask questions. Why were DOE's estimates so far off from those of the GAO? What was the basis for DOE's estimates? Did they have the calculations to back their estimates up?

The answers from DOE were not encouraging. There were no documents backing the estimates. Nor should this be surprising, according to DOE—a lot of administration breeder calculations are, "a back of an envelope type of thing." If this is so, how can DOE argue there is $8 billion to be made? Answer: "It was just to give people a perspective on the issue."

This makes for sad reading. Indeed, if this is the way DOE does business, we all have reason to worry.

National Public Radio has done us all a public service in supplying us with a transcript of its report on Clinch River aired last Thursday. Also we have firm information on the GAO briefing courtesy of a Dear Colleague letter produced on the House side. I ask that the complete text of both documents be entered into the RECORD.

The material follows:

NATIONAL PUBLIC RADIO BROADCAST "ALL THINGS CONSIDERED" DECEMBER 2, 1982

(By Dan Zwerdling)

The controversial Clinch River Breeder Reactor could be in trouble again. President Reagan says the proposed experimental reactor is crucial for the future of nuclear power. Opponents call the breeder a technological turkey and a waste of money. Just before the election, the Senate saved the breeder from defeat, but by only one vote. Now a new showdown is coming up and PR's Daniel Zwerdling has more.

The Administration has been persuading many legislators to back the breeder by insisting that the reactor will make money. Energy Department officials have told the Congress that the breeder would earn between 8 and 20 billion dollars profit during the life of the reactor. And during the recent Senate debate on the breeder, that operate, but the GAO says try 50% more. The Administration says that income from the breeder will top at least 16 billion dollars maybe twice that, but the GAO staff says try 30% less. The result according to GAO researchers, the Clinch River Breeder could lost billions of dollars and the taxpayers would have to make up the losses. Energy Department officials say they haven't seen the draft report and they stress that it's not yet final.

John Longenecker manages the Breeder program; "We have made what we consider to be realistic and very well founded assumptions on the cost."

In order to figure out why the estimates are so different, GAO investigators asked the Energy Department to give them all the documents the Administration used to justify its figures. But according to GAO's staff, the Energy Department has not turned over all the documents. Sources close to the investigation say that some of them were accidently thrown out. Gordon Chipman, Deputy Assistant Secretary told me in a phone call that there is nothing surprising about that. He said a lot of the Administration's breeder calculations have been, in his words, "a back of an envelope type of thing". In that case I asked how can the Department really claim that the breeder will make 8 billion dollars? That figure Chipman answered is just a rough figure, designed "just to give people a perspective on the issue". The House and Senate will vote on appropriations for the breeder before Christmas. I am Daniel Zwerdling in Washington.

HOUSE OF REPRESENTATIVES,
Washington, D.C., December 3, 1982.

CLINCH RIVER BREEDER REACTOR PRICE TAG JUMPS TO $11 BILLION

DEAR COLLEAGUE: Recently, the supporters of the Clinch River Breeder Reactor Project (CRBR) have asserted that revenues from the operation of the CRBR will provide a net return of $8.2 to $20.7 billion from the project. This has led some CRBR supporters to claim that the project will return many times its original investment.

The General Accounting Office (GAO) requested the Department of Energy's (DOE) documents that justified these curious estimates. After a period which the GAO describes as a "contemptuous delay" of 4 to 5 weeks—DOE officials alleged they had inadvertently destroyed the requested documents.

However, the GAO has just performed its own analysis of projected CRBR revenues and expenses. It shows, convincingly, that the claim is not only complete nonsense, but also that if the CRBR project is completed, its operation may cost the taxpayers as much as an additional $3.3 billion. These operational costs are in addition to CRBR's already massive construction cost, which GAO estimated earlier this year could exceed $8 billion.

Construction and operation of the CRBR now threaten to cost more than $11 billion, and this figure could grow even more.

The basis for the GAO's estimate is as follows:

The Department of Energy has overestimated by 8.5 million megawatt hours the amount of electricity the CRBR will generate. To achieve the DOE's claim, the CRBR must maintain a capacity factor of 80 percent for more than 10 years—something neither the French Phenix breeder nor conventional nuclear reactors have done.

The GAO used a more realistic average 63 percent capacity factor, a figure which is based on the operating experience of the statement that the breeder will pay its own way was crucial, and the Administration has been making the same argument in recent weeks as the Congress gets ready for a new showdown on the breeder. But a confidential draft study by the GAO staff concludes the opposite. Far from making money the GAO report says the Clinch River Breeder would lose money. It would lose more than 3 billion dollars over the life of the plant. The way GAO researchers see it the Energy Department's basic assumptions about the breeder are wrong. So the Administration says the breeder will cost 5 billion dollars to Tennessee Valley Authority plants and is consistent with overall experience in the United States. However, it must be remembered that the CRBR is an experimental design and cannot be expected to operate as efficiently as a conventional nuclear powerplant.

The DOE estimates that it will be able to sell the reactor's power for much more than TVA estimates it will pay. Moreover, the DOE estimate is based on a method of electricity pricing which is at variance with the DOE-TVA contract.

The result is that the GAO believes the net 30 year revenues from CRBR power sales will be at least $3.8 billion, or 23 percent less than DOE claims.

The DOE has also seriously underestimated the 30 year cost of operating the reactor. The GAO estimates that operation and maintenance costs will exceed the DOE estimate by $2.4 billion. The GAO estimates an additional $5.4 billion in reprocessing and fuel related costs (even considering credits from plutonium produced) will be incurred—costs for which the DOE has not accounted.

Apart from these serious miscalculations of revenues and expenses, the DOE has seriously underestimated the project cost. The GAO now estimates the project's construction cost will exceed $8 billion—far more than the DOE estimate of $3.6 billion. The GAO also believes the CRBR will experience significant cost growth similar to that of other nuclear projects in recent years. Based on GAO's findings, we have concluded that the Congress will need to appropriate more than $1 billion in FY 1984—four times this year's proposed appropriation of $227 million—if the project is to remain on schedule and even greater costs are to be avoided.

In the face of Federal deficits which may reach $200 billion, then Congress simply must not continue to authorize a project for which there is no foreseeable need and the total cost of which could exceed $11 billion.

We urge you to vote for the Coughlin/Wolpe amendment to delete funds for the Clinch River Breeder Reactor when the Energy and Water Development Appropriations bill is voted on in the House of Representatives.

Sincerely,

John D. Dingell, Morris K. Udall, Fernand J. St Germain, Lawrence Coughlin, Vin Weber, John E. Porter, Hamilton Fish, Ed Bethune, Richard L. Ottinger, Jonathan B. Bingham, Silvio O. Conte, Howard Wolpe, Claudine Schneider, Judd Gregg, Bill Green, and George E. Brown, Jr.

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PROCEEDINGS AND DEBATES OF THE 97th CONGRESS, SECOND SESSION

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Senate

CLINCH RIVER—DOE IMPUTING ITS OWN INTEREST

● Mr. HUMPHREY. Mr. President, yesterday and last Tuesday I entered material into the RECORD detailing how much the Clinch River breeder reactor project will cost American taxpayers to operate and maintain after it is built. Today, however, I would like to return to just how much the project will cost to construct.

The Department of Energy (DOE) now claims that the project will only cost $3.6 billion to complete. The General Accounting Office (GAO), on the other hand, claims that this estimate is unrealistic, specifically, that DOE's estimate does not include the cost of financing construction. This expense, known as imputed interest, is quite high. GAO estimates that it will add $3.9 billion to the project's final cost.

When the GAO came out with this estimate in September, however, DOE in Washington complained that it was unfair, that imputed interest should not be included in calculating Clinch River's costs since it was a research and development facility.

That was in September when it was in DOE's interest to exclude imputed interest in their cost estimates. Earlier in the year when DOE was attempting to fast-track a limited work authorization license from the Nuclear Regulatory Commission (NRC) for Clinch River site preparation work, DOE then argued that it was important to fast-track Clinch River's construction to avoid additional imputed interest costs.

This point, moreover, was not just made in passing. In a separate submission dated February 23, 1982, DOE's own private accounting consultant, Arthur Andersen & Co., defended DOE's use of the imputed interest argument.

Throughout the summer at NRC proceedings, DOE repeated this argument for fast-tracking the licensing of the project. Indeed, it repeated the argument so many times that initially it was caught off guard when the GAO came out with its September finding of $3.9 billion in imputed interest costs. Thus, Percy Brewington, Clinch River's acting project director, first answered reporters' questions about the GAO finding by arguing that limiting the high cost of borrowing money—imputed interest—was one of the reasons for pushing ahead with the project. As he explained to the Knoxville Journal, interest should be considered in any examination of the cost of the breeder.

DOE, of course, now argues that we ought not to include imputed interest. It certainly is not a cost to them. It is, however, a major cost to the American taxpayer who must pay interest on the loans the Government must take to retire the national debt. GAO understands this. Every utility when it borrows money is forced to recognize this. And even DOE recognizes this when it is in its interest to do so.

We are fortunate that DOE makes many of its arguments publicly. We have copies of Arthur Andersen & Co.'s submission to the NRC and of Percy Brewington's comments in the Knoxville Journal.

I ask that the text of both of these documents be entered into the RECORD.

The documents follow:

BREEDER COST $8.9 BILLION IN NEW FORECAST

(By Joe Krakoviak)

The General Accounting Office has released a pair of reports that indicate eventual cost of the Clinch River Breeder Reactor project could be as high as $8.9 billion—$5.3 billion more than the latest estimate by the Department of Energy.

The GAO estimate follows by a week two other estimates made by both sides of the experimental nuclear program to produce electricity with a process that breeds more plutonium fuel than it uses.

GAO did not give exact estimates in its reports, instead describing situations not considered in the DOE estimate and giving a range of possible costs.

Breeder officials, however, said most of the added costs should not be considered as part of the estimate.

Main expenses GAO focused on were imputed interest, up to $3.9 billion over the life of the project, and the value of plutonium, perhaps as high as $1.2 billion.

GAO said Congress should be aware that interest costs associated with the project could amount to as much as $3.9 billion.

Admitting that inclusion of the costs of borrowing money from private sources isn't done with any federal project, GAO said nevertheless the figure should be considered. Percy Brewington, acting project director, agreed that interest should be considered in any examination of the cost of the breeder.

He also suggested that if the GAO insisted on considering the time value of money, the agency should also be concerned about finishing the project and protecting the $1.3 billion already spent.

One report said the eventual plutonium cost would be much higher than the $10 million figure the DOE used. Quoting DOE officials, GAO said the real value of the 6.2 million grams of plutonium would range from $143 million to $1.2 billion—depending on how much plutonium came from existing defense stockpiles and how much from reprocessing plants.

John Wagoner, a DOE employee and deputy project director, said the plutonium would not actually cost anything, since it would eventually be returned. And because of the "breeding" of plutonium, the payback would include any fuel created during the program.

"The Congress (during original budgeting in the early 1970s) understood that all the plutonium would come from existing defense stockpiles and then be returned," Wagoner said.

The other report said DOE underestimated the actual cost of the project in three main areas other than plutonium: implicit interest expense, the estimated revenue from selling electricity generated during testing and the allowance for construction contingencies.

GAO said DOE disregarded projections by Tennessee Valley Authority of the utility's power demands and payments for extra electricity over the five-year life of the test to overestimate by $53 million—$680 million rather than $627 million—eventual income which would be used to reduce the project's cost.

Brewington said any predictions are "really very speculative," but that he has confidence in the project's estimate.

The report also faulted DOE's estimate of the average production capacity—the percentage of usage at full operation—of the plant. GAO said the 75 percent figure used was more than the 63 percent average compiled from statistics of the 72 commerical nuclear plants—resulting in an overage of $120 million.

Brewington called the figure "reasonable," adding that the present estimate was up to 82 percent capacity. He said the breeder reactor wasn't impacted by changes in sister plants as with commerical reactors, it benefited from more reliable design techniques, and it refueled only half as often.

GAO questioned DOE's allowance for construction contingencies, about 9.2 percent out of a $973 million cost.

ARTHUR ANDERSEN & Co.,
Washington, D.C., February 23, 1982.

U.S. NUCLEAR REGULATORY COMMISSION,
Washington, D.C.

GENTLEMEN: This is to respond to the Commissioners' request that I provide (1) comments I might have on the Applicants' submissions, and (2) an analysis of the increased interest costs that would be incurred as a result of a one-year delay of the Clinch River Breeder Reactor Plant Project.

My comments on the Applicants' submission fall within three categories of delay cost.

a. Inflation;

b. Personnel retention, deferral of revenue and a permanent stretch-out of the construction period of one year;

c. Interest on the present capital investment.

A. As to inflation.—Inflation has been reflected in the construction costs because it causes actual incurred costs to increase. To assume no inflation would be unrealistic and would cause capital planning and budgets to be unreal. The rate of 8% per annum seems reasonable for planning purposes.

B. As to personnel retention, deferral of revenue and deferral of capital expenditures.—The parties agree that there are delay costs associated with maintaining the managerial personnel during the period of delay. Applicants have calculated the cost of maintaining this personnel at $41.8 million per year. When appropriately discounted, the total cost is $38 million per year.[1]

As to the deferral of revenue, a one-year delay will cost the Project between $5.9 million and $20 million per year in 1982 dollars per the record in this case. Intervenors base the $20 million on the avoided cost of power from coal generation. We understand that, if the avoided cost were based on petroleum generation, the cost of deferral of revenue would increase by a large factor. We have noted that the $5.9 million is understated because it is for a five-year period of time rather than for the estimated service-life of the plant. Because of this, the $20 million cost of deferred revenue should be a more realistic basis for measuring the cost incurred as a result of the delay.

As to the permanent stretch-out of the construction period by one year, the Applicants' exhibit shows that the cost would be a "saving" of $30 million on a present-worth basis and a cost of over $136 million with inflation of 8 percent per year.

The above three cost matters, which were deployed by the Applicant, are summarized in millions of dollars.

[Dollars in millions]

	High	Low
Increased cost of personnel	$38	$38
Lost revenue	20	20
Subtotal	58	58
Inflation, gross	136	
Inflation, discounted		(30)
Total cost	194	28

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[1] The discount calculations are attached as exhibits 3, 4 and 5. At the Feb. 16, 1982, Commission meeting, applicants estimated that the effect of discounting would be to decrease management costs by about $11 million. A more precise analysis by the applicant shows that this effect is significantly less. In particular, it was not necessary to discount Project Office or Stone & Webster management costs. The costs for both of these groups were already discounted in calculating the anticipated savings due to delay.

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Senate

CLINCH RIVER—$8.5 BILLION IN WASTE

● Mr. **HUMPHREY**. Mr. President, I have long opposed continued funding of the Clinch River breeder reactor project on the grounds that it is too expensive and is unnecessary. Indeed, the true cost of the project has been a contentious issue.

We now, however, have a fair idea of how much the project will cost. Today the General Accounting Office (GAO) released its final cost estimates on the project. Its report concludes that the project could cost $8.5 billion—over twice what the Department of Energy (DOE) projects.

GAO also noted in its report that the plutonium fuel for Clinch River would probably have to come from our military stockpile and that DOE intends to return to the military the plutonium the reactor will breed. As the GAO noted, this could raise serious legal questions. A key provision currently carried in both the House and Senate versions of the Nuclear Waste Policy Act prohibits the transfer of spent nuclear fuel from peaceful civilian reactor fuel to DOE for use in the manufacture of nuclear weapons.

A good review of the GAO report was published in yesterday's New York Times by Judith Miller. I ask that the entire text of the New York Times article be placed in the RECORD.

The article follows:

BREEDER REACTOR FAULTED ON COST

(By Judith Miller)

WASHINGTON, December 11.—The General Accounting Office has concluded that the Reagan Administration's cost estimates for the Clinch River breeder reactor "should be viewed with caution." It says the project at Oak Ridge, Tenn., could cost $8.5 billion, more than twice the Administration's estimate.

These conclusions are contained in a 20-page report by the Congressional auditing agency. The study, requested by the House Energy Subcommittee on Oversight and Investigations, is scheduled to be released Monday.

Energy Department spokesmen could not be found for comment today. But officials strongly disputed similar calculations in an interim study issued by the G.A.O. in September. Neverthless, the auditing agency has adhered to and expanded on its original estimates in this final report.

Because much of the Congressional debate about the Clinch River reactor is focused on cost, the latest report could intensify opposition to the project. The G.A.O's cost projections are expected to carry weight in Congress because the agency, while criticizing the management and the pace of the program, has consistently supported the effort to develop the breeder, a plutonium-fueled reactor intended to produce more plutonium than it consumes.

CRITICS CALL IT A LUXURY

Even in its final report, the agency says that because Clinch River was a research and development project, cost estimates "should not be the dominant considerations in funding decisions."

But some fiscal conservatives, critics of nuclear energy and liberals who oppose the project argue that building the Clinch River reactor is a luxury in an era of budgetary constraint.

"If Congress fails to kill this technological turkey in light of these new cost estimates," said Richard L. Ottinger, the Westchester Democrat who is chairman of the oversight subcommittee, "then we have totally lost our sense of budget priorities."

A vote in the Senate could come next week. There the majority leader, Senator Howard H. Baker Jr. of Tennessee, is championing the project. Last week Clinch River's proponents and opponents lobbied vigorously to win the votes of undecided legislators.

The Clinch River project, first authorized by Congress in 1972 and estimated then to cost $700 million, has survived many attempts in Congress to terminate financing. The Carter Administration tried to kill it because of concern that breeder reactors would facilitate the spread of nuclear weapons.

CONSTRUCTION ESTIMATE UNDISPUTED

The new report does not dispute the Department of Energy's estimates for plant construction and major reactor and nonreactor components, which represent about $3 billion of the department's $3.6 billion estimate.

But it says the Department has failed to include or has underestimated several other cost factors. It said the value of the plutonium required to fuel the reactor "could range from $196 million to $261 million," rather than the $10 million estimated by the department.

Based on interviews with officials from the Department of Defense and Energy, the G.A.O. said there could be problems with several assumptions about the source and disposition of the reactor's plutonium. The officials told the auditors that plutonium for Clinch River could come from military programs, among other sources. Defense Department officials said they expected that the plutonium supplied to Clinch River would eventually be returned to the military program.

But the report says this approach fails to take into account a provision in a bill now being considered by a House-Senate conference that would ban the use of plutonium from peaceful nuclear facilities in the manufacture of nuclear explosives. The G.A.O. said it had not analyzed whether such transfers of plutonium between the military and civilian sectors would be legal if that provision became law.

The report also calls insufficient the $165.6 million allocated by the Department of Energy for contingencies, including changes required by regulation, legal actions and design improvements. Allowances of $302 million to $644.3 million would be more appropriate, the G.A.O. concludes.

CITES SALARIES NOT INCLUDED

It says the Energy Department's failure to include salaries for department officials assigned to the project could add $29 million to $39 million.

The G.A.O. says the Energy Department has overestimated by as much as $212 million the expected revenues from the sale of electricity in Clinch River's five-year demonstration period.

But the major dispute between the Administration and the agency is over the interest the Treasury pays on borrowed money used to finance Federal projects. The report, like the earlier study, concludes that such interest through 1994 could total $3.9 billion.

When the G.A.O. issued its first report, Gordon L. Chipman, Deputy Assistant Secretary of Energy for Breeder Reactor Programs, argued that the interest should not be included in the assessment. Such interest costs, he argued, should not be applied to research and development projects that were not intended to break even.

The G.A.O. acknowledges that neither the Department of Energy nor the Office of Management and Budget requires that the interest be included in the cost of Government projects. "Nevertheless," the report says, "it is a real cost which G.A.O. believes is relevant to Congressional decisions on funding projects, such as C.R.B.R., which require large capital investments."●

C. Interest on the present $1.1 billion capital investment.—Interest is a cost of doing business that arises from the fact that capital must be raised and committed to each project. It must then be serviced during each time period from its formation and commitment to the project through the completed service-life of the project.

It is often described as a real cost because it is a hard-core, unavoidable cost just like engineering, construction materials, construction labor, manufactured components and configurations of purchased equipment and the many other elements comprising the total cost of a new facility.

A possible delay of Clinch River has raised the question of the costs of a one-year delay. Our experience with delays due to material shortages, labor strikes, fires, explosions, accidents and regulatory processes illustrate that the cost of interest is an inescapable part of delay costs.

In the event of a one-year delay in the construction of Clinch River, interest will be incurred for one extra year. This is so because capital (money) is a commodity with real value. It can be exchanged for other items of value, loaned to another party or invested to produce a return to its owner. The use of capital resources over a period of time causes a cost to be incurred. During any period of a project delay in construction, the capital or interest costs continue to accumulate. Such costs are measured by dollars of capital required, the timing of capital requirements, the rate or cost at which the capital is available and the length of the period of time to completion of the project. In short, the cost of money is incurred from the beginning of construction to the time of placement of the project into continuous demonstration or revenue producing service, the purpose of the project in the first instance.

Accounting Standard No. 34 of the Financial Accounting Standards Board states:

"The historical cost of acquiring an asset includes the costs necessarily incurred to bring it to the condition and location necessary for its intended use. *If an asset requires a period of time in which to carry out the activities necessary to bring it to that condition and location, the interest cost incurred during that period as a result of expenditures for the asset is a part of the historical cost of acquiring the asset.*" (Emphasis added.)

The accompanying Exhibit I demonstrates the incremental cost that would be incurred as a result of a one-year increment in the time period of constructing a plant. In the example, we assume a project in which $100 million are expended annually in each year of a 20-year construction schedule and an 11 percent interest rate. In comparing the no delay and one-year delay cases, the cost of delay is measured by the capital funds spent to the time of the delay, the period of delay and the capital cost rate.

This Exhibit shows that:

In 1982, $145 million of interest cost would be incurred while the plant activity is idle.

1995 is the year when extra or avoidable interest cost is paid under the delay.

The $145 million incurred in 1982 due to the delay would be worth $563 million at the end of the construction period if the delay would be avoided. In other words, that real economic saving would pay the last five to six years of construction costs.

The example which I described in my previous presentation before the Commission also illustrates this concept. The example I refer to is the person that is constructing his own home using construction financing. He is his own general contractor and at 75 percent completion, an electrical installation approval must be secured before additional work can proceed. The approval process is delayed for six months and construction cannot proceed. The true economic fact to the person building his home is that his costs have increased. He had to carry the accumulated cost on the 75 percent completed home because he borrowed from the bank, had already expended the funds, and had to pay interest for the six-month delay period.

Exhibit II applies this concept specifically to the Clinch River Breeder Reactor Plant Project and shows the true future cost impact upon the project. As shown in that Exhibit, interest is accrued for an extra year in the delay case, and, thus, a one-year delay will result in additional interest on expended capital of $737.4 million. Discounted to present value, the cost of delay in 1982 is approximately $190 million.

Accordingly, I believe that the Applicants' conclusion is correct. Interest on expended capital is a real and substantial cost to the project, including that interest that would result from any delay in construction.

Very truly yours,

JERRY E. WALKER.●

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Senate

CBO AND GAO ON THE NUCLEAR FUEL CYCLE ACTIVITIES ACCOUNT

● Mr. HUMPHREY. Mr. President, just a few days ago, the Environment and Energy Study Conference Floor Brief focused attention on a House and Senate Appropriations Committee proposal to establish a nuclear fuel cycle activities account. In the past all nuclear programs, except for uranium enrichment, were placed in a single account. What the committees now proposed to create is two accounts. One account would consist of nuclear research and development activities. Another would consolidate uranium supply and enrichment, the Clinch River breeder reactor project, and nuclear waste disposal activities.

The logic behind this move, the committees state, is to "bring together those parts of the nuclear fuel cycle from which revenues are currently or will in the future be derived." Uranium enrichment is sold to utilities and produces revenues. Clinch River will produce revenues if it is completed and operates. And under the Nuclear Waste Policy Act, waste disposal activities will be paid for through fees that will be levied against the utilities.

At first glance, this scheme looks sensible. House Members, however, have already voiced concern that this new accounting procedure may lead to enrichment and waste disposal fees being used to pay for controversial account activities such as Clinch River.

I share this concern. Recently, the General Accounting Office and the Congressional Budget Office wrote replies to a letter of inquiry I sent them concerning the account. Both GAO and CBO state in their letters that moneys from enrichment and nuclear waste fees could be used to fund Clinch River's construction. The GAO, moreover, states that the proposed account would violate both existing uranium enrichment law and the House and Senate versions of the Nuclear Waste Policy Act. Existing uranium enrichment law prohibits the use of enrichment fees for anything but enrichment activities, and the Nuclear Waste Policy Act as it now reads prohibits the use of nuclear waste disposal fees for anything but nuclear waste disposal.

Neither the Department of Energy nor the Office of Management and Budget have yet replied to the letters I sent them. Both are waiting for clarification from the House Appropriations Committee. They both would like more legislative history on the report to ascertain its meaning. I believe they are entitled to this and that we ought not to reference the nuclear fuel cycle activities account language in the continuing appropriations resolution during the lameduck session. Certainly, it would be a mistake to move without some debate about the account.

In any such discussion, GAO's and CBO's replies will be useful. I ask that the complete text of my letter and these replies be placed in the RECORD.

The letters follow:

NOVEMBER 18, 1982.

Mr. CHARLES A. BOWSHER,
Comptroller General of the United States,
The U.S. General Accounting Office,
Washington, D.C.

DEAR MR. BOWSHER: I am writing to learn what your office's view is concerning the House Appropriations Committee proposed Nuclear Fuel Cycle Activities Account. I have enclosed copies of the pertinent passages of the Committee's House Energy and Water Development Appropriations Bill and report where this account is described. Is it your office's interpretation of the Committee's legislative and report language that:

1. The account would have two revenue streams in Fiscal Year 1983. The first would be gross receipts raised from DOE's sale of uranium enrichment services and the second would be revenues from the nuclear waste disposal fee proposed in pending nuclear waste legislation.

2. There would be outlays from the account to pay for three types of activities—enrichment, fuel cycle demonstration activities (Clinch River now and possibly commercial reprocessing later), and nuclear waste disposal activities.

3. Under the Committee's proposed accounting procedure, user fees now paid by enrichment customers to cover enrichment activity costs could be spent on account activities unrelated to enrichment (Clinch River Breeder Reactor Project and nuclear waste disposal activities) and user fees proposed to pay the costs of nuclear waste disposal activities could be spent on account activities not listed under the "Nuclear Waste Disposal Activities" heading.

4. Nearly $173,604,000 will be available to the account after making all of the Committee's projected account outlays for FY 1983 and this money could be used to cover part of the future costs of such account activities as the Clinch River Breeder Reactor Project.

Finally, I would also like to know if it is your office's view if the Committee's proposal particularly as described in points two through four above accords with the President's desires.

Given that this matter will come before the Congress during the Lame Duck session, I would appreciate a reply as soon as possible.

With warm regards, I am
Sincerely yours,
GORDON J. HUMPHREY, USS.

U.S. GENERAL ACCOUNTING OFFICE,
Washington, D.C., December 10, 1982.

Re Subject: Comments on the new "Nuclear Fuel Cycle Activities" Account Included in House Bill 7145 (GAO/RCED-83-79).

Hon. GORDON J. HUMPHREY,
U.S. Senate.

DEAR SENATOR HUMPHREY: On November 18, 1982, you requested our views on aspects of the new "nuclear fuel cycle activities" appropriation account included in House Bill H.R. 7145, 97th Congress. The bill makes appropriations for energy and water development for fiscal year 1983. The bill would create a new appropriation account for current and potential revenue-producing Department of Energy (DOE) civilian nuclear fuel cycle activities. These activities include uranium supply and enrichment, nuclear waste management, reprocessing, and demonstration projects. The bill requires that DOE use the revenues it receives from each activity to offset its costs for that activity, to deposit any such revenues received in excess of such costs in the "nuclear fuel cycle activities" account, and to use these excess revenues to offset any other obligations against the account.

OBJECTIVE, SCOPE, AND METHODOLOGY

You requested our views on four statements listed in your letter:

The account would have two revenue streams in fiscal year 1983. The first would be gross receipts raised from DOE's sale of uranium enrichment services and the second would be revenues from the nuclear waste disposal fee proposed in pending nuclear waste legislation.

There would be outlays from the account to pay for three types of activities—enrichment, fuel cycle demonstration activities (Clinch River now and possibly commercial reprocessing later), and nuclear waste disposal activities.

Under the committee's proposed accounting procedure, user fees now paid by enrichment customers to cover enrichment activity costs could be spent on account activities unrelated to enrichment (Clinch River Breeder Reactor Project and nuclear waste disposal activities) and user fees proposed to pay the costs of nuclear waste disposal activities could be spent on account activities not listed under the "nuclear waste disposal activities" heading.

Nearly $173,604,000 will be available to the account after making all of the committee's projected account outlays for FY 1983 and this money could be used to cover part of the future costs of such account activities as the Clinch River Breeder Reactor Project.

In responding to your request, we reviewed H.R. 7145 and the accompanying House Report No. 97-850, the applicable provisions of DOE's authorizing legislation, and the respective differing nuclear waste policy bills passed by the Senate (S. 1662) and the House (H.R. 3809). DOE officials declined to discuss this matter with us pending the Secretary of Energy's determination of DOE's position on the proposed new account. Our audit was performed in accordance with generally accepted government auditing standards.

Our views on the statements in your letter are discussed below.

THE ACCOUNT WOULD HAVE TWO REVENUE STREAMS IN FISCAL YEAR 1983

The statement in your letter is correct. The House Appropriations Committee report (Report No. 97-850) on H.R. 7145 states that the purpose of the new "nuclear fuel cycle activities" account is to bring together those parts of the nuclear fuel cycle from which revenues are currently or will in the future be derived. In so doing, not only does the bill appropriate funds for nuclear fuel cycle activities, but it requires DOE to retain the revenues generated by those activities to offset costs of the activities. Without this requirement the revenues would be deposited into miscellaneous receipts of the treasury. In fiscal year 1983, according to the bill, only the uranium enrichment and nuclear waste management activities are expected to produce revenues.

Fiscal year 1983 revenues from DOE's uranium enrichment activities are expected to be slightly more than $2 billion. Revenues from nuclear waste management activities are estimated to be $300 million. At present, however, DOE is not authorized to collect revenues from utilities or others to offset DOE's cost of managing their nuclear wastes. Therefore, estimated revenues from waste management activities are dependent on the Congress enacting the pending nuclear waste policy legislation. Separate versions of this proposed legislation have passed the Senate and the House. Both versions would permit DOE to begin collecting revenues for its civilian nuclear waste management activities.

THERE WOULD BE OUTLAYS FROM THE ACCOUNT TO PAY FOR THREE TYPES OF ACTIVITIES

There would be outlays from the "nuclear fuel cycle activities" account up to the amounts appropriated for three activities—uranium enrichment, Clinch River Breeder Reactor, and nuclear waste management. The total appropriation for these activities is slightly more than $2.36 billion in fiscal year 1983. Revenues from these activities, estimated to be slightly less than $2.31 billion, would be placed in the "nuclear fuel cycle activity" account. These estimated revenues, plus an additional estimated net appropriation of $53,646,000, would be used as shown below.

Activity	*Appropriations*
Uranium supply and enrichment	$1,949,096,000
Clinch River Breeder Reactor	227,250,000
Nuclear waste management	185,000,000
Total	2,361,346,000

The amounts that would be appropriated for nuclear fuel cycle activities and available for DOE's use in fiscal year 1983 under H.R. 7145 are not dependent upon the actual revenues realized in fiscal year 1983. Regardless of the revenues received from uranium enrichment and waste management activities, the bill makes definite appropriations in the amounts shown above for each of the three activities.

For example, as noted earlier, the estimated $300 million in revenues from the waste management activity is contingent upon enactment of the pending nuclear waste policy legislation. If this proposed legislation is not enacted, revenues received into the account will decrease by $300 million. However, the total appropriation for the "nuclear fuel cycle activities" account—and the amounts appropriated for each of the three activities—would remain as shown above. In this case, the net fiscal year 1983 appropriation for the account would be $353,646,000 instead of $53,643,000.

REVENUES FROM ANY ONE NUCLEAR FUEL CYCLE ACTIVITY COULD BE SPENT ON OTHER ACTIVITIES

As we interpret H.R. 7145, revenues from any one nuclear fuel cycle activity in excess of the appropriation for that activity could be used to offset costs of other activities in the account for which funds have been appropriated. As such, the bill is inconsistent with both the existing uranium enrichment program authorization legislation and the pending bills on nuclear waste policy because the enrichment legislation and waste policy bills prohibit the use of revenues from these respective activities for any other purposes. This interpretation is compelled by the following language of the bill:

"* * * (3) any revenues received in excess of fiscal year 1983 appropriations for uranium supply and enrichment activities or nuclear waste management activities shall be deposited to the credit of the *nuclear fuel cycle activities account and used to offset any other fiscal year 1983 or future obligations against the account*: Provided further, that the total sum herein appropriated shall be reduced as revenues are received during fiscal year 1983 so as to result in a final fiscal year 1983 appropriation estimated at not more than $53,646,000." (italics added)

Under the quoted last proviso, a final fiscal year 1983 appropriation estimate of not more than $53,646,000 from the general funds of the Treasury cannot be achieved without using revenues in excess of appropriations for uranium enrichment and nuclear waste management activities to offset costs of the Clinch River Breeder Reactor. As long as the excess receipts over activity appropriations are retained in the individual uranium enrichment subaccount and the individual nuclear waste management subaccount, there will always be a final appropriation from the general funds of the Treasury for the "nuclear fuel cycle activities" account of at least the dollar amount of the appropriation for the Clinch River Breeder Reactor Project, since it does not yet generate any offsetting revenues. In fiscal year 1983, that would be $227,250,000.

Moreover, subparagraph (3), quoted above, states that excess revenues from any activity over and above that activity's appropriation shall be used to offset any other fiscal year 1983 obligations against the "nuclear fuel cycle activities" account. Under the Antideficiency Act (31 U.S.C Section 1341), the activity with the excess revenues could not legally incur any obligations for fiscal year 1983 over and above the dollar amount appropriated for that activity. Therefore, the language "any other fiscal year 1983 . . . obligations against the account" in subparagraph (3) must be referring to obligations of other activities within the "nuclear fuel cycle activities" account. This constitutes specific authority to commingle receipts of any particular activity in excess of its appropriation with those of any other activity within the "nuclear fuel cycle activities" account for the purpose of offsetting obligations of the other activities.

As we interpret H.R. 7145, revenues received from DOE's uranium enrichment activity in excess of the approximately $1.95 billion appropriation for this activity would be deposited in the "nuclear fuel cycle activities" account and would be used to offset other obligations against that account—such as the Clinch River Breeder Reactor Project and nuclear waste management activity. The bill estimates that revenues from DOE's uranium enrichment activity will exceed the appropriations for that activity by slightly less than $59 million. We emphasize, however, that the total amount of funds which could be spent on any individual nuclear fuel cycle activity, such as the Clinch River Project, is limited to the amount appropriated for that activity in the bill.

H.R. 7145 is inconsistent with DOE's program statute with respect to the use of uranium enrichment receipts. Subsection (h) of section 111, Energy Reorganization Act of 1974, as amended (42 U.S.C. 5821(h)), authorizes DOE, when so provided in an appropriation act, to retain revenues produced by its uranium enrichment activity, but only for the expressed purpose of offsetting operating expenses of that activity. The receipts are not available to DOE for any other purpose.

Similarly, according to H.R. 7145, revenues received from DOE's nuclear waste management activities in excess of the $185 million appropriation for those activities would also be deposited in the "uranium fuel cycle activities" account, and would be used for uranium enrichment activities and/or the Clinch River Breeder Reactor Project. The bill estimates that revenues from the nuclear waste management activity will exceed the appropriation for that activity by $115 million.

Both the House and Senate versions of the pending nuclear waste policy legislation would establish a trust fund or similarly segregated fund for the deposit of nuclear waste management fees. However, both the House and Senate versions of this proposed legislation would permit DOE to use these monies only for specified waste management activities. Therefore, H.R. 7145 is inconsistent with these bills.

THE $173,604,000 WILL BE AVAILABLE TO THE ACCOUNT AFTER MAKING PROJECTED ACCOUNT OUTLAYS

As shown below, revenues estimated in H.R. 7145 from uranium enrichment and nuclear waste management fees exceed the appropriations for these two activities by $173,604,000.

[In thousands of dollars]

Activity	Fiscal year 1983		Amount available for other account uses
	Estimated revenues	Appropriation	
Uranium enrichment	2,007,700	1,949,096	58,604
Nuclear waste management	300,000	185,000	115,000
Total	2,307,700	2,134,096	173,604

The bill, specifically the provision quoted above, provides that these revenues shall be used to offset any other obligations against the "nuclear fuel cycle activities" account in fiscal year 1983 or in future years. The only legally permissible fiscal year 1983 obligation against the "nuclear fuel cycle activities" account, besides the uranium enrichment and nuclear waste management activities, is the Clinch River Breeder Reactor Project. Therefore, all of the estimated $173,604,000 of revenues in excess of appropriations would have to be used to cover the costs of the Clinch River Project. The $173,604,000 of excess revenues, added to the $53,646,000 estimated net appropriation shown in H.R. 7145, equals the $227,250,000 appropriation for the Clinch River Project. This further confirms our interpretation that the bill provides for the use of revenues in excess of appropriation from any one nuclear fuel cycle activity to be used to offset the cost of other activities.

As noted earlier, however, the fiscal year 1983 appropriation for the Clinch River Breeder Reactor is not dependent upon DOE's receipt of revenues in the amounts estimated in H.R. 7145. The bill establishes a definite appropriation for that project of $227,250,000 regardless of revenues received into the account. Conversely, an increase in revenues beyond estimates in H.R. 7145 would not allow additional expenditures in fiscal year 1983 beyond the specific amounts appropriated in the bill for the Clinch River Breeder Reactor Project or the other nuclear fuel cycle activities. The additional revenues would instead be used to decrease the estimated $53,646,000 net fiscal year 1983 appropriation for the "nuclear fuel cycle activities" account.

Copies of this report are being sent to the Subcommittee on Energy and Water Development, House Appropriations Committee; to the Director, Office of Management and Budget and the Secretary of Energy; and to other interested committees of the Congress. Copies of this request will also be made available to others upon request.

Sincerely yours,

J. DEXTER PEACH,
Director.

CONGRESSIONAL BUDGET OFFICE,
U.S. CONGRESS,
Washington, D.C., November 30, 1982.
Hon. GORDON J. HUMPHREY,
U.S. Senate,
Washington, D.C.

DEAR SENATOR: This letter is in response to your questions concerning the House Appropriations Committee's proposed nuclear fuel cycle account. CBO's understanding of the Committee report is that there would be two receipt streams in fiscal year 1983, receipts collected from uranium enrichment sales and fees for nuclear waste disposal, which would be used to finance activities designated by the Committee under that account. Such activities include uranium enrichment, nuclear waste disposal, and development of the Clinch River Breeder Reactor. The receipts would not be earmarked for specific programs, and thus the fees derived from uranium enrichment or nuclear waste disposal could be used to cover the costs of other programs within the account. We estimate that approximately $174 million in 1983 receipts will be available to cover the costs of such activities.

The President in his 1983 budget request, the Senate in S. 1662, the National Nuclear Waste Policy Act of 1982, and the authorizing committees of the House, have all proposed that fees for nuclear waste disposal be placed in a fund established in the Treasury for the sole purpose of developing a nuclear waste program. Under these proposals, receipts in excess of annual obligations would be invested in interest yielding bonds and would be used in future years to fund nuclear waste disposal activities. If some of these receipts are spent for other purposes, future fees for nuclear waste disposal would have to be adjusted to replace the expended amounts, and any interest that would have been earned.

As you state in your letter, outlays for the proposed nuclear fuel cycle account would represent the collection of receipts and spending for uranium enrichment, nuclear waste disposal, and the Clinch River Breeder Reactor. If at a later stage, the funding levels in the House-reported Energy and Water Development Appropriations Bill were limited to uranium enrichment and nuclear waste disposal activities, outlays charged to the account would decrease. Outlays, however, would increase in another account, assuming that Clinch River funding remains constant. This would result in no change in total federal outlays. As a result, total federal outlays in 1983 will not be affected by differences between the President's proposed structure and that of the House Appropriation's Committee.

Should you so desire, we would be pleased to provide further details.

Sincerely,

ALICE M. RIVLIN,
Director. ●

CLINCH RIVER TIME TO SUBMIT SEPARATE LEGISLATION

● Mr. HUMPHREY. Mr. President, as I noted before in a RECORD entry of September 14, if the promoters of alternative financing for the Clinch River breeder reactor project truly believe their plan to be sound, they should submit it in the form of separate legislation before it is considered on the Senate floor. By using such normal procedures, the backers of such financing would assure that their plan would be reviewed by all the appropriate authorizing and appropriating committees in the House and Senate.

They also would eliminate the stigma that would naturally be associated with any effort to end-run normal procedure by trying to attach complex and controversial legislation on a continuing appropriations resolution at the last minute. Finally, by submitting separate legislation, the backers of the plan would avoid breaking the Senate rules' own structure against legislating on an appropriations bill.

In fact, by the Department of Energy's (DOE's) own admission, alternative financing legislation for Clinch River is not simply an appropriation, but gives the Secretary of Energy new authority to contract, first, to share ownership in the plant or the revenues it produced; second, to repay participants if the plant is terminated; third, to insure revenues from the plant; fourth, to indemnify participants against changes in Federal laws affecting their participation; fifth, to indemnify participants and the operator against uninsured liabilities; and sixth, to purchase and sell power from or for the project. Finally, the plan would give DOE new multiyear spending authority for the project—currently the project is not authorized for fiscal year 1984—totaling $1.5 billion.

Since the Senate Energy and Natural Resources Committee has agreed to hold hearings September 22 on the plan, it makes sense to submit separate legislation on it. Until now, DOE has refused to submit such legislation and has said that it will not. This is odd since DOE has been working day and night preparing such legislation and has had some version of it for the last 2 months or more. In fact, recently, the House Energy and Commerce Oversight Subcommittee obtained copies of DOE's work. Apparently DOE has been attempting to do the Senate Energy and Natural Resources Committee's work since DOE not only has a complete draft bill dated September 12, 1983, but a suggested committee report draft dated September 12, 1983, and a complete clause-by-clause analysis of the bill as well.

Mr. President, given that the Congress asked DOE to perfect a substantive cost-sharing plan for the Clinch River project nearly a year ago and DOE submitted its suggestions in March, it is simply inexcusable that the backers of the plan have refused to submit separate legislation and instead have been holding out to attach this legislation at the last minute on the continuing appropriations resolution where full and measured consideration of the plan will be most difficult.

I ask that the full text of DOE's draft legislation, draft committee report, and clause-by-clause analysis be printed in the RECORD along with a copy of the formal request I have made of the Energy and Natural Resources Committee to submit DOE's draft legislation as a separate bill before hearings are held this Thursday.

The information follows:

WASHINGTON, D.C.,
September 20, 1983.

JAMES A. MCCLURE,
Chairman, Senate Energy and Natural Resources Committee, U.S. Senate, Washington, D.C.

DEAR JIM, I want to thank you for scheduling Senate hearings on the off-budget Clinch River financing plan for next Thursday. As Senator Bumpers and I have noted several times before, it is essential that separate legislation for this plan be submitted and referred to the various authorizing and appropriating committees so that no question of the Senate's willingness to cooperate with the House is raised in this matter.

I believe that proceeding with separate legislation also is the most prudent course and especially so since the Department of Energy has already made available an alternative financing bill, a clause-by-clause analysis, and draft committee report (see attachments). Certainly, if the supporters of alternative financing for the project believe this plan is sound, they have nothing to fear from submitting it to Congress in the form of separate legislation. As Senators Bumpers, Hart, Boschwitz and I have stated before, we would welcome such legislation's expeditious consideration.

Since a draft of this legislation is n
available and the Energy and Natural R
sources Committee has scheduled hearin
for this Thursday, I would hope this b
would be submitted as a matter of cour
Indeed, with such draft legislation n
available, it would be a mistake to burd
the continuing appropriations resolution
attempting to amend it with Clinch Riv
legislation. Such an attempt, I fear, wou
not only violate existing rules against leg
lating on an appropriations bill, but force
lengthy and tedious debate on the floor.

With warmest regards, I am
Sincerely,
GORDON J. HUMPHREY,
U.S. Senator.

[DOE Draft Bill, September 12, 1983]

CLINCH RIVER BREEDER REACTOR

For construction and operation of the Clinch River Breeder Reactor project, $1,500,000,000, to be available until expended but contingent upon commitments, satisfactory to the Secretary of Energy, for utility and private sector financial participation for a minimum of 40 per centum of the Department of Energy estimate of remaining capital costs as reported to Congress on March 15, 1983.

In addition to the amounts herein appropriated and in consideration for such financial participation, the Secretary is authorized to contract incontestably to (1) provide to participants ownership interests in the project, products, services and/or revenues from the project, (2) repay funds invested by the participants subsequent to the passage of this Act, plus interest, if the project is terminated, not completed or not licensed for operation, (3) insure revenues from the project, (4) indemnify participation against changes in Federal tax laws, regulations and rulings affecting the tax consequences of their financial participation in the project, (5) indemnify participants and the operator against uninsured liabilities with respect to the project, and (6) purchase and sell power, products and services from or for the project.

Such contracts may be assigned and shall be enforceable against the United States in accordance with their terms except in the case of fraud by the assignee. Participation in the project shall not subject a participant to regulation under the Public Utility Holding Company Act of 1935. All monies received by the Secretary under this heading may be retained and obligated for the purposes of the project without further appropriation and shall remain available until expended.

Of the $1,500,000,000 appropriated by this heading, up to $270,000,000 may be obligated during fiscal year 1984, of which $135,000,000 may be obligated notwithstanding any other provision of this heading; and up to the following amounts may be obligated during the following fiscal years: $285,000,000 during 1985; $290,000,000 during 1986; $290,000,000 during 1987; $185,000,000 during 1988; $75,000,000 during 1989; $105,000,000 during 1990 and beyond. Notwithstanding any other provision of this Act, the authority provided in this heading shall be available until fully utilized.

[DOE Draft Committee Report, September 12, 1983]

COMMITTEE REPORT ON CLINCH RIVER BREEDER REACTOR APPROPRIATION

This Act appropriates $1.5 billion (60 percent) of the March 15, 1983 DOE estimated costs to complete the CRBR Project, $135 million of which is unconditionally available in fiscal year 1984 and the balance of which is available only if utility and private sector commitments are obtained to finance the remaining $1 billion (40 percent) of such costs and if such commitments are satisfactory to the Secretary. Private sector financing could be a combination of debt and equity or, if equity can only be obtained at costs or on terms which the Secretary determined are unreasonable, all debt. Such commitments would include 750 electric utilities (including TVA) and project contractors, in addition to the $150 million which they will have contributed by the end of the fiscal year 1983, as well as underwriting agreements with investment bankers for the purchase and sale of securities, contracts for borrowing from institutional investors and/or banks and/or contracts for equity funds from corporations which would obtain customary tax benefits from the investment of such funds which they could otherwise obtain from the investment of such funds in other projects.

All private sector commitments are expected to include conventional conditions to the private sector financing as well as the condition that certain Federal contracts be in full force and effect. Such commitments would be satisfactory to the Secretary if he has a reasonable basis to believe that such commitments will be met and that such financing would be provided by such commitments, after considering such matters as he deems relevant, which may, but need not necessarily include, (i) the financial condition of the proposed private investors who made such commitments; (ii) the terms of any conditions to such financing and whether it appears to him that such (terms are reasonable) conditions have a reasonable possibility of being satisfied; and (iii) the qualifications and experience of any underwriters which will obtain such financing.

The federal government has been and will continue to be the principal designer and construction manager of the Project which will be operated by TVA. Under the contemplated arrangements, private sector investors will have no control of the Project during any portion of its useful life. This Act authorizes the Secretary to contract on a long-term basis to provide assurances to such investors that (a) the Project will be completed, (b) its revenues will be adequate to pay its expenses, including debts service, (c) expected tax benefits (will be maintained despite) due to any changes in the tax laws, regulations of IRS interpretations although their individual tax situation may not permit them to realize such benefits, and (d) private participants and the operator will not be liable for uninsured risks with respect to the Project this Act also authorizes contracting for shared ownership of the Project by the government and private investors and for the sale of power.

The Federal contracts which private sector investors will require are the types of contracts specifically excepted from the Anti-Deficiency Act. The investors may decide not to commit to make investments in the Project unless such contracts are incontestable, provide the kinds of assurances which are essential to obtaining utility and private sector financing as described in the June 29, 1983 Breeder Reactor Corporation [illegible]C) Task Force Report to the Secretary pres[illegible]ting the BRC plan for private financing for the project in response to the December, 1983 Congressional directive to the DOE ". . . to . . . explore proposals . . . that would reduce Federal budget requirements for the CRBR Project . . . and secure greater participation from the private sector."

The BRC plan would (1) make no change in existing Project objectives or management arrangements including decision making authority and responsibility for safety, (2) make no change in current licensing procedures or requirements, (3) does not require any further review of financial qualification and (4) makes no changes in the environmental aspects of the Project. Current Project contracts will be honored under the BRC plan, although it is expected that the TVA will no longer be the sole purchaser of electricity generated by the plant and will not exercise its option to purchase the entire plant after completion of the demonstration period. This Act, therefore, authorizes a modification to the existing Project arrangement which would otherwise require that power produced by the plant be acquired by TVA.

The **Chairman**. Senator Bumpers, do you have questions of Senator Humphrey?

Senator **Bumpers**. No; Senator Humphrey and I are blood brothers on this issue.

The **Chairman**. Senator Domenici.

Senator **Domenici**. I have nothing at this point, Mr. Chairman.

The **Chairman**. Senator Hecht.

Senator **Hecht**. Nothing.

The **Chairman**. Thank you very much, Gordon. I'm not surprised by your position. You have been very forthright in your position in the past and we have a difference of opinion and we'll have the opportunity to debate that difference and the facts that are behind that difference at a later time. And I will look forward to that discussion. But I have no questions at this time.

Senator **Humphrey**. Thank you.

The **Chairman**. I should have at the outset introduced my own formal statement. I'll not take the time of the committee or the witnesses here today, but it will be made a part of the record at the beginning, at the opening of this hearing this afternoon.

Senator **Bumpers**. Mr. Chairman, I also ask that my opening statement be inserted in the record.

The **Chairman**. It is so ordered.

STATEMENT OF HON. DALE BUMPERS, A U.S. SENATOR FROM THE STATE OF ARKANSAS

Senator **Bumpers**. Mr. Chairman, I am pleased that we are holding hearings to consider the cost-sharing plan which the Department of Energy has submitted for the Clinch River breeder reactor project. I must confess a great deal of skepticism about this plan. Although it it ambiguous on some points, it seems only to capitalize temporarily the anticipated revenue stream from the hoped-for operation of the project, and because that operation is very doubtful, it adds a government guarantee which will only make this fiasco more expensive for the Government than merely paying for it directly from the Treasury.

As I read this plan, it does not increase the contributions of utilities and industry beyond their current obligations, and it confers tax benefits upon them which they would not now receive. Therefore, in after-tax terms, the plan reduces their costs. Similarly, the plan requires several guarantees from the Government, including a guarantee of completion, of licensing and of a continuation of current tax breaks. Therefore, the plan reduces their risks.

By the same token, according to the report of the Congressional Budget Office, the plan will increases the Government's costs by $2.0 billion in nominal terms and $250 million in discounted, constant dollars. It also increases the Government's risks because it is required to complete the project no matter what happens. If war is declared, if we experience flood and famine, if budget deficits grow even more, if technology clearly passes by this monstrosity even more than it already has, if demand for electricity shrinks, if alternative sources of energy are developed, and on and on, we will still be required to build this mausoleum.

The plan is founded upon the hope that the project will produce enough power to be sold at high enough price to retire bonds issued on the strength of that presumed revenue stream and, more importantly, on the strenght of a Government guarantee to pay the obligation if the revenues are insufficient. First, if that revenue ever develops, it will exist which or without this plan. Thus, the Government will have that benefit without having to pay the greater than average interest rates which the bonds would bear. Second, the forecasts underlying the revenue stream are highly doubtful, so it is a very thin reed upon which to base our hopes.

The Department of Energy assumes that the plant will operate at 65 percent capacity for 30 years, that its operating costs—not counting an amortization of plant costs—will be 5.5 cents per kilowatt-hour, and that it will sell power at an average of 11 cents per kilowatt-hour. If those assumptions prove true the plant will yield $110 million per year, which would retire the $1.04 billion in debt in 30 years if the interest rate is 10 percent.

The fragility of the plan can be illustrated by changing these assumptions by 10 percent. If the plant operates at 58.5 percent capacity, operating costs are 6.0 cents per kilowatt-hour, and power is sold for 10 cents per kilowatt-hour, the plant will produce only $76.9 million per year. If interest rates on the debt are 11 percent, the revenue needs would be $119 million. There would be an annual deficit of $42.1 million for 30 years. Furthermore, it is hopelessly optimistic to assume that this point will operate for the full 30 years. With a 20-year lifespan of generating deficits of $42.1 million per year, it would produce $1.5 billion, about 47 percent of the amount necessary to retire the private debt.

This plan, which combines characteristics of safe harbor leasing and financing of the WPPSS plants, appears to need vast revision. As it stands, it is a fraud.

The **Chairman**. You'd be very welcome to sit in Senator Humphrey.

We have a panel which will now present testimony to us. The first panel is the Honorable Shelby T. Brewer, Assistant Secretary for Nuclear Energy, Department of Energy; James J. O'Connor, chairman of the Breeder Reactor Corp.; Frederick S. Potter, vice president, Capital Markets, Merrill Lynch, New York. I understand that Mr. Corey has been delayed but Mr. Hobelman and Mr. Vieregg are here and will sit in in his absence.

Mr. Secretary this isn't the first time we've heard from you on this subject. If we're lucky, maybe it will be the last time. You may proceed. We have your full statement. It will be made part of the record in full.

You may proceed to deliver that statement or summarize it in whatever manner you desire.

STATEMENT OF HON. SHELBY T. BREWER, ASSISTANT SECRETARY FOR NUCLEAR ENERGY, DEPARTMENT OF ENERGY

Secretary **Brewer**. Thank you Mr. Chairman. I would like to summarize the statement.

My purpose today is to present to this committee the Department's response to the fiscal year 1983 continuing resolution directive which required the Department to explore ways of reducing Federal outlays for Clinch River by increasing private participation in the project. The proposed alternative financing plan does just that.

The central concept of the plan is to market the commercial value of the plant by capitalizing on the market value of the 30-year revenues during the construction phase. This results in a savings in Federal outlays by about 40 percent.

To attract such private capital the Government must offer several forms of guarantees. In exchange for the Federal outlay savings, the Government does assume some contingent liabilities which I will describe, but these liabilities are not probable in our view and are not much different from the intrinsic liabilities in the existing arrangement. In fact many of the obligations for outlays in the existing arrangement become contingent liabilities in the new plan, such as the full cost to complete the project.

Senator **Domenici**. Might I just ask a question at this point?

By way of clarification, when you refer to the existing arrangement to be contrasted with the new proposal, what existing arrangement are you talking about?

Secretary **Brewer**. The existing arrangements that we now have to operate the plant on the TVA grid for 5 years as a demonstration project with the revenues being based on the avoided cost on the TVA grid.

Senator **Domenici**. You mean assuming the current policy which Congress has declined to complete. You're comparing that with the new one?

Secretary **Brewer**. That's exactly the comparison that I'm making. The existing arrangement with TVA and the other partners versus the new plan which has been submitted to Congress.

The architecture, Mr. Chairman, on the new funding plan is as follows. The cost to go is $2.5 billion which includes about $216 million in contingency. That is to be split, $1.5 billion in appropriations and $1 billion in private funding. The private funding is as follows: $675 million in debt, $150 million in equity, and the remaining BRC contribution of $175 million totals $1 billion.

Now, what makes this possible is the prospect of a significant enhancement in the electricity price by selling power outside the TVA grid and further by extending the service life of the plant from 5 years to 30 years. The revenue stream that we have assumed is conservative: 11 cents per kilowatt-hour in the service region outside of TVA. Eleven cents per kilowatt-hour is sufficient to service the debt and to pay all operating costs. And moreover, if the revenue stream exceeds 11 cents per kilowatt-hour which seems likely, the residual, after operating costs and debt service, is available for sharing by the U.S. Government and the equity partners in an arrangement to be determined.

Now, in reviewing and analyzing and examining this proposal within the Department we have been acutely sensitive to the net effects on the Treasury and to any added federal risk. The first issue that we examined is is there any real net savings to the Treasury, and the conclusion is that yes there is, even if you assume no revenues back to the Treasury during the operating phase, you, at least save $825 million less the revenue stream under the existing plan.

The second issue which we've spent a great deal of attention on is the credibility of the cost estimate. Admittedly the cost growth on this project since its inception in 1971 has been enormous. The dynamic environment surrounding the project subjected it to policy debate and delay and insufficient funding appropriations. But even in a static environment, it is reasonable to expect a range of opinions regarding the cost estimate.

To provide an independent review of project cost for our consideration, I engaged the DOE's Independent Cost Estimating team (ICE) in the fall of 1981 at the time we were rebaselining and streamlining the management of the project. The ICE team provided much valuable input to management in this rebaselining effort. Much of their input was, in fact incorporated in official estimates, but some of it was not. Over this 2-year period you will recall that assumptions on which a cost and schedule estimate must be based were quite volatile. It was a moving target. We did not know for example whether we would be successful in the Code of Federal Regulations section 50.12 request. We were having at that time some very favorable experience in procurements, running about 18 percent below estimates. On the other hand, there were massive uncertainties as to appropriations.

The key issues between estimates made by the Department and the ICE team Mr. Chairman, have been resolved and as a result the Department is confident that $2.5 billion is reasonable and prudent.

The project circumstance at this point is unique. Over 90 percent of the design is completed whereas typically with a commercial light water reactor at the stage of initiating construction stage, only about 25 percent of the design is complete. Over 70 percent of the equipment is on order and has been costed and half of that in fact has been delivered. We have a unique labor situation involving what we call the rolling 4-10 which allows a 70-hour workweek rather than a 40-hour workweek. We have bid data over the past 18 months which is running 18 percent below estimate.

The project cost of $2.5 billion includes a contingency of about $216 million in construction and a departmental margin of $123 million in schedule.

The alternative financing proposal will provide the stable optimal funding program necessary to complete the project within the $2.5 billion estimate. If a stable commitment is not made by Congress then I must admit that all bets are off.

A third issue which we have spent a great deal of attention on is is there any risk assumed by the private sector investors under this arrangement. Both debt and equity investors assume the usual market risk of any long term investment. That is the risk that a better investment will come along and that must be foregone. Moreover, the equity investors incur two additional risks. First of all, they may not be in an advantageous tax bracket during construction and thereafter under the existing tax code. And second, there may not be sufficient revenues during operation to allow them to recoup their principle during the operation period.

Mr. Chairman, in closing I would like to place the issue of alternative funding in context. If we were talking about the development of some academically interesting technology with marginal benefits then I would not personally be so passionate about this technology. But what we are talking about is a quantum jump, an essentially inexhaustible energy resource, a secure energy source for electrical production for many thousands of years.

There's been much debate over the past 10 years on this subject. Do we need the breeder? If so, when? Is it economic and when will it be economic? I could fill this chamber with many learned academic treatises on the subject. But are the same tests put to the other inexhaustibles? Will fusion power be needed? If so, when? These questions are rarely raised or answered, but yet we spend about $500 million a year on fusion research and development, and it's money very well spent.

What is at stake, Mr. Chairman, far transcends the value of this particular project. What is at stake goes beyond the prospect of turning our backs on 30 years of scientific and engineering achievement, of walking away from a total breeder program investment of over $5 billion, the $1.5 billion already invested in this project.

What is at stake, Mr. Chairman, is our seat at the table of international nuclear commerce—our leadership, our role, our influence in international nonproliferation policy and safeguards policy. But even more fundamental, Mr. Chairman, what is at stake is our ability as a free society to sustain a national commitment over numerous political cycles. To stay the course and to get anything done which is large and technically complex and requires many decades to develop.

Mr. Chairman, as Federal officials we must take a look at the Nation's tax resources carefully. We believe the financing plan offered by the administration is responsive to the continuing resolution directive and is far preferable to the existing arrangement or to the option of terminating the project now. And we urge Congress to give the plan careful consideration.

Thank you, Mr. Chairman. I'll be happy to respond to questions.

[The prepared statement of Assistant Secretary Brewer follows:]

Statement of Shelby T. Brewer
Assistant Secretary for Nuclear Energy
U.S. Department of Energy

Before the Committee on Energy and Natural Resources
U.S. Senate

September 22, 1983

Mr. Chairman, I am pleased to appear before the Committee to continue the dialogue on alternative funding for the Clinch River Breeder Reactor Project. As you know, the Conference Report accompanying the FY 1983 Continuing Appropriations Act (P.L. 97-377) directed the Department of Energy to explore alternatives for securing additional private-sector participation in the Breeder Reactor Project in order to reduce the requirement for Federal budget outlays. I will review the actions taken to date to comply with that directive and describe the principal provisions of the proposed Alternative Financing Plan. I will also address certain questions relating both to the financing plan and to the project in general.

Development of the Alternative Financing Plan

In December of 1982, a Utility Task Force was organized under the auspices of the Breeder Reactor Corporation to develop alternative financing plans that would be responsive to Congressional criteria for continued Federal funding of the Clinch River Project. On March 15, Secretary Hodel forwarded the Utility Task Force progress report to Congress along with a DOE report on alternative financing for Clinch River.

The financing plan prepared by the Task Force proposed, in effect, for the owners to sell the generating capacity aspect of the project to private investors. The Task Force financial experts estimated that the plan would bring the private-sector contribution for the Clinch River Project to approximately $1 billion, or 40 percent of the estimated cost to complete the plant; this would correspondingly reduce the remaining Federal funding requirements from approximately $2.5 billion to approximately $1.5 billion. The Task Force further believed that the electricity generated from the project could be sold at higher prices than would have been the case under existing arrangements, thereby increasing the revenue stream.

The Task Force report also stressed that any arrangement involving increased private-sector participation would require government assurance that the project would be completed without further delays and would operate successfully. This is a reasonable expectation, since the Federal government would retain the overall management responsibility for the Clinch River Project, and government actions in large measure would determine and control the project schedule and costs.

The March 15 report provided a preliminary outline of a potential funding arrangement, with specific provisions of the funding plan to be developed and further refined. Because the details of an acceptable proposal were not available when Congress passed the FY 1984 Energy and Water Development Appropriations Act (P.L. 98-50), funds for the Clinch River Project were not included. The accompanying Senate Committee report, however, stated that "the Committee is deferring this matter without prejudice." The comparable House Committee report stated that "[i]f an alternative financing arrangement can be worked out, the Committee would consider appropriating funds to continue the project."

Mr. Chairman, since that time a more detailed plan has been developed. This plan was delivered to the Department of Energy on June 29, 1983. On July 21, President Reagan, in a meeting with utility and industry representatives, expressed strong support for the proposed funding arrangement, and on August 1, the Department, on behalf of the Administration, forwarded the plan to Congress.

Elements of the Alternative Financing Plan

Private Funds

- The financing plan envisions that approximately $150 million will be raised through equity participation by private investors. In addition to a share of any excess revenues above the requirements for debt service and operation and maintenance, the equity investors would also expect to receive tax benefits not unlike those associated with a similar industrial investment. This would include investment tax credits and deductions for interest and depreciation; no tax benefits would be sought on that portion of the project financed with Federal funds. It should also be noted that all income attributable to private investment in the project will be subject to Federal income tax. Although the tax aspect of the financing plan is complex, with both losses and gains of revenue, the Department of the Treasury has advised us that the net effect on the Federal Treasury during the life of this project is expected to be zero.

- $175 million had already been pledged to the CRBR Project by utilities and industry, prior to the development of the Alternative Financing Plan. When added to the funds already contributed, this will bring the total utility/industry contribution to $325 million, the largest private commitment ever made for a single Federal energy research and development project. This is a pure contribution, with no expectation of participating in the benefits of the revenue stream or ownership interest in the project.

- Approximately $675 million (plus interest) is expected to be raised through interim construction borrowing. Potential lenders are largely institutions such as banks, insurance companies, and pension funds. Once construction is completed, it is expected that the accumulated debt, plus interest, would be replaced through the sale of long-term taxable bonds. The repayment of this financing will be based on the sale to utilities of electricity generated by the Clinch River Breeder Reactor and on the Federal government's commitments to successfully complete and operate the project. The Task Force believes that the projected net revenues should be adequate to support bonds of approximately $1 billion.

Revenues

The net revenues projected by the Utility Task Force from power sales under the Alternative Financing Plan are significantly higher than those available under the current arrangement for two main reasons. First, under the plan, it is expected that electricity from the Clinch River plant can be sold to utilities in the South that have large amounts of oil- and gas-fired generating capacity, rather than to TVA at its lower avoided energy cost, which is largely hydro, coal, and nuclear. Second, the project will seek contracts with utilities to sell electricity over 30 years rather than the 5 years now provided for in the existing arrangement. The revenues expected to be received from sales outside the TVA area have been estimated to be sufficient to cover project operating costs and to pay debt service.

Surveys of utilities in the South indicate reasonable assurance that the electric power generated by the project could be readily absorbed in the 1990's at prices approaching the full market price for replacement power. This gives considerable credibility to the revenue assumptions for the project.

Support for the Alternative Financing Plan

Support for the alternative financing proposal is broad-based. Four leading Wall Street investment banking firms have endorsed it as a feasible plan with a high probability of success; eleven utilities have expressed interest in purchasing the electric power to be generated by the Clinch River Breeder Reactor, with three of the eleven interested in purchasing about half of the plant's output. In addition, a number of companies have expressed interest in investing in the project, and we have received letters to that effect from twenty-two industrial firms.

On July 21, 1983, representatives of the Breeder Reactor Corporation, the nuclear industry, organized labor, and investment firms presented the Alternative Financing Plan to the President and senior Administration officials. At that time, the President emphasized his strong personal support for the completion of the Clinch River Breeder Reactor Project under the provisions of the Alternative Financing Plan and pledged to work to ensure acceptance and implementation of the financing proposal. We are also pleased by the bipartisan expression of support that this funding arrangement has received from a number of Congressional leaders, as evidenced by a "Dear Colleague" letter dated August 16, 1983.

Issues Raised by the Alternative Financing Plan

A number of issues have been raised about the Alternative Financing Plan. We have tried to address these as forthrightly and objectively as possible. We desire to be responsive to all concerns in working out an acceptable arrangement for completing the Clinch River Project.

I would like to discuss some of the major issues at this time.

- First, does the Alternative Financing Plan sacrifice retention of revenue by the government ~~in~~ the future for assistance in capitalization now? Is there any real cost saving to the government, or are we only moving money around in time, with no net saving?

  The existing arrangement for completing the project anticipates that the net revenues accruing to the government during 5 years of operation of the plant would provide up to $400 million to offset the cost to complete the plant. This would result in a net cost to the government of $1.925 billion to complete the project ($2.5 billion overall cost to complete, less private contribution of $175 million, less $400 million in revenues). In addition, the Federal government would have to sell this plant. The existing arrangement provides TVA with the option to purchase the plant at the market value of the plant to the TVA system. TVA presently contemplates an excess of capacity and has indicated a strong probability that it would not acquire the plant. If TVA does not exercise its option to acquire the plant, the market value of the plant will be diminished, since it is unlikely that other utilities would acquire generating facilities located within TVA's grid.

In the Alternative Financing Plan, it is conservatively estimated that the net revenues resulting from the sale of electricity will be sufficient to cover the cost of private financing, i.e., to pay the interest on and retire the debt. Assuming that excess revenues will not be generated, the $400 million revenue stream to the government would be forfeited under the plan, but the cost to complete would be reduced by the $1 billion private investment, yielding a net appropriation required of $1.5 billion. Thus, the net additional saving to the government to complete the construction and demonstration of CRBR from the Alternative Financing Plan is $425 million ($1.925 billion less $1.5 billion).

- How credible is the DOE cost estimate? How would a cost overrun be handled?

Anticipating the need to have a current, credible cost estimate available to support our consideration of the Alternative Financing Plan, the Secretary requested that an independent review of the CRBR Project Office cost and schedule estimates be performed. An Independent Cost Estimate (ICE) Team, under the Assistant Secretary for Management and Administration, was commissioned to prepare this assessment. As the assessment proceeded, a number of issues were identified. The key issues, I believe, have been resolved, and we have found that the ICE Team report reinforces our confidence in the estimates. Any residual issues are not thought to have the potential of significantly affecting the conclusion that the project can be completed for approximately $2.5 billion. The $2.504 billion includes the base estimate of $2.381 billion (including about $216 million in contingency) and a departmental margin of about $123 million to cover varying estimates as to when power will reach the electrical grid.

In addition to this independent assessment, after the Alternative Financing Plan was forwarded to the Congress, I prepared a report on the cost and schedule issue, fully coordinated within the Department. That report has been provided to the Committee. The analysis resulted in some adjustments to the cost and schedule estimate used in the DOE March 1983 report to Congress. These changes increased the total estimated cost to complete the CRBR Project by $41 million and slipped the schedule by 3 months. Both of these adjustments are well within the parameters of the Alternative Financing Plan's provisions.

Cost increases of the type typically experienced in large construction projects are not expected to have a high likelihood for the CRBR, because of the advanced stage of the project. In addition, special labor contract provisions have been obtained, and a contingency of over $200 million is included in the cost estimate.

As you know, any undertaking of this enormous size and complexity -- whether managed by government, private industry, or the best architect-engineers/constructors in the world -- frequently experiences delays from unforeseen circumstances. Natural phenomena such as weather problems can cause delay; changes in the regulatory process concerning design and safety criteria are unpredictable; and delays can be experienced in obtaining material and equipment from suppliers. These and other factors can change the pace of construction and the ultimate cost of the project. Therefore, neither I nor anyone else can guarantee what will happen from this day forward.

I am sure you are aware of an independent report, prepared for DOE's Independent Cost Estimating team, which arrived at an estimate of the construction period and time required to achieve full-power operation that is at variance with the Department's consensus estimate. This project is therefore like many others, in that "experts" can disagree. On balance, however, we are not presently persuaded that this independent estimate should be regarded as more convincing than the consensus estimate of the Clinch River Breeder Project Office and the Department's Independent Cost Estimating group.

With all of this as background, I believe that the cost estimate of $2.504 billion, which is the consensus position within the Department, should be achievable. This is not to say that there will be no cost increases, but I can say, based on the evidence available today, that it would be reasonable to conclude that we will not experience a cost growth that cannot be accommodated within the estimate of approximately $2.5 billion to complete.

- Is any risk assumed by the private sector under the Alternative Financing Plan?

As I mentioned earlier, under the proposed Alternative Financing Plan, the Federal government would retain complete responsibility for management and control of the project. This is consistent with the fact that the primary mission of the project will remain research and development, even under the revised funding scheme. As such, the private investors would assume no project-related risk *per se*.

The private investors would, however, incur market risks normally associated with investments of this type. They would, for instance, incur the risk that more attractive opportunities may develop which they would have to forego because of their very long-term investment in the Clinch River Breeder Reactor Project. They would risk the possibility of not realizing the anticipated tax benefits should their income tax liability change significantly. Also, the uncertainty associated with the realization of revenues in excess of those necessary to cover operating costs and service the debt imposes a risk on the private investors.

- Does the government's risk increase or decrease under the Alternative Financing Plan?

From the viewpoint of uncertainty and risk, the government stands to gain significantly should the proposed Alternative Financing Plan be approved and implemented. The benefits will accrue largely as a result of the certainty that will be established with regard to the project funding profile. With the assured availability of appropriated and privately contributed funds, a predictable optimal schedule can be established and maintained, thus eliminating one of the significant sources of cost increase experienced to date.

In very broad terms, the General Accounting Office's (GAO) independent assessment of the preliminary and final alternative financing proposals concluded that while the government appears to retain most of the project-related risks, it did not find any source of increased risk to the government above that which already exists. In the worst possible case, as GAO noted, the government might have to pay for the Clinch River plant on the basis of the private sector's cost of money instead of the government's cost of money. The added cost, however, would be small and would be incurred only in the unlikely case of complete failure of the project.

- Is completion of the Clinch River Project consistent with the Administration's energy policy?

  The developmental nature of this project would tend to classify it as an anomaly among the projects and programs which this Administration desires to encompass within its energy strategy. As an element of energy policy alone, it probably would not be started by this Administration if it were proposed to be initiated today.

  Clearly, however, it is the Administration's belief that this project should be finished, since so much time, effort, and money have been expended on it, and since we will most assuredly learn from it things that will help future generations. The completion of the Clinch River Project would fulfill the government's commitment to this long-term, high-risk energy option.

Importance of the Clinch River Breeder Reactor Project

Before closing, Mr. Chairman, I would like to step back from the details of the funding for the Clinch River Project to refocus on the significance of this endeavor. Despite frustrations in making progress on the Clinch River Project in the past, today the project is on track and moving well. The design work is more than 90 percent complete. Over

70 percent of the equipment for the plant is on order or already delivered. Licensing activity is proceeding well; the construction permit, which is no longer contested, is expected by the end of the year. Excavation of the nuclear island site is virtually complete, and both environmental and safety hearings are complete.

With the experience gained from the Clinch River Project, the nation will be entering the final phase of its breeder development program. The Federal government will have fulfilled its responsibility of bringing the technology to a point at which the private sector can assume the initiative in making decisions about the prototype demonstration and commercial deployment of the breeder concept. To withdraw from the mission now would be tantamount to closing the door on our most advanced source of inexhaustible electrical energy for future generations.

We must also beware of underestimating the time required to introduce an advanced technology into the industrial system. Estimates of future energy demand can change dramatically in a short period of time, as we have learned over the past decade. The steady trend in increased use of electricity, coupled with the economic recovery that is daily more evident, could easily prove our electricity demand estimates for the coming decades to be understated. Responsible planning includes energy insurance for the future. An available inexhaustible energy supply option should be a vital element of that insurance.

Of equal importance, our continued participation as a recognized world leader in advanced nuclear technology supports our national nonproliferation objectives. The demonstration of our ability to complete our nuclear development commitments will contribute significantly to our effectiveness at the negotiating table in determining international policies on nonproliferation and nuclear safeguards.

On this basis, I urge your careful evaluation of what we have to gain from completion of the Clinch River Breeder Reactor Project, as well as what we stand to lose if we terminate the project at this point. The Administration is most eager to arrive at an acceptable financial arrangement, and I believe that the Alternative Financing Plan before us has the requisite elements. If we are to avoid further costly disruptions and delays in the Clinch River Project, it is imperative that Congress enact the legislation necessary to implement this plan as quickly as possible. A multi-year appropriation of $1.5 billion of the government's remaining cost, combined with the necessary authority to implement the Alternative Financing Plan, will permit us to establish the stable funding profile necessary to ensure the timely and efficient completion of the project.

Mr. Chairman, I look forward to working with this and other Congressional committees to enhance the prospects for long-range energy security. If there are any questions, I will be happy to respond to them at this time.

The CHAIRMAN. We'll hear from Mr. O'Connor.

STATEMENT OF JAMES J. O'CONNOR, CHAIRMAN AND PRESIDENT, COMMONWEALTH EDISON CO., AND CHAIRMAN, BREEDER REACTOR CORP., CHICAGO, ILL.

Mr. O'CONNOR. Thank you very much, Mr. Chairman, and good afternoon.

My role as chairman of the Breeder Reactor Corp., and this is an organization which represents 753 electric systems nationwide from all sectors of our industry including the privately owned, municipal, and the REA's.

We are a nonprofit organization which began in 1972 at the request of the Government and we were invited by the Government to join in the design and construction of the Nation's first large-scale liquid metal fast breeder reactor demonstration plant.

The $325 million which has been contributed by the industries is the largest contribution ever made by our industry to a single R&D project. We made this commitment because we saw the development of the breeder reactor necessary to achieving the full potential of the Nation's uranium resources. As you know this potential is several times greater than our Nation's combined resources of fossil fuels and is one which can provide for our Nation's electric power needs for the next century and beyond.

In addition to my position with the DRC I also serve as chairman and president of the Commonwealth Edison Co. Our company along with the Tennessee Valley Authority is party to the principle project agreements and that means as such we are contributing managerial and technical support to the project over and above our financial contributions.

Our financial advisory task force has convened in response to a congressional mandate and in response to a congressional charge to the U.S. Department of Energy to quote:

> Vigorously explore proposals including a reconsideration of the original cost sharing arrangement that would reduce Federal budget requirements for the Clinch River Project and secure greater participation from the private sector.

The task force has fully met that charge of Congress. It has proposed a plan which can attract significant private investment in the project thus reducing the Federal Government's financial obligations. And both Mr. Vieregg and Mr. Hobelman who are with me today are here to respond to particular questions about that plan.

From its inception the Clinch River project has received unprecedented support from the scientific community, professional organizations and from industrial, utility, labor, and governmental leaders who bear the responsibility for developing energy policy and planning and building energy facilities to meet the Nation's needs for electricity both now and in the future. The breeder reactor project invites this high priority because national energy security considerations mandate the establishment of a domestic bulk energy source that is inexhaustible as we have heard from Mr. Brewer.

Clinch River provides the best means of establishing the goals of the U.S. breeder program. No alternative demonstration of breeder technology could be undertaken without incurring a serious loss of time, greater cost, risk, and uncertainty and a waste of valuable natural resources.

The breeder project, Clinch River, is the most advanced breeder design in the world today in all aspects except size, and it's size was selected so that it would not be too large a scale up from its predecessor plant the FFTF now operating successfully in Hampton, Wash.

The Clinch River design has been favorably reviewed at least 20 different times by independent Government and industrial organizations to insure that it is sound and is at the forefront of the technology. And the need to proceed with the project has been confirmed time and time again by virtually every authoritative study addressed in the U.S. breeder program.

As has been mentioned the cost to complete the project is $2.5 billion. In response to congressional direction the utility industry has reaffirmed its support and commitment to the project by developing a financing plan which can provide up to $1 billion for 40 percent of the cost to complete the project. Two-thirds of the funds available for the project will be raised through borrowing supported by revenues from future power sales. Another $150 million will be raised through new equity participation and $175 million is in the form of R&D contributions already committed by the electric utility industry.

The financing plan has been endorsed by representatives of four leading investment banking firms and they're represented with us today. The new investment funds would be provided for project construction under a proposed Federal-private sector joint venture arrangement which would reduce Federal outlays and the Federal Government's budget deficit at a time when budgetary expenditures are a widespread concern.

The Nation's electric power suppliers, public, investor-owned, and rural electric cooperatives, have supported Clinch River from the outset and have again reaffirmed our commitment to the project and have presented a financing plan. Commitment by the Congress to adopt that plan and complete the Clinch River project is essential.

Thank you very much.

[The prepared statement of Mr. O'Connor follows:]

STATEMENT

OF

JAMES J. O'CONNOR

CHAIRMAN AND PRESIDENT, COMMONWEALTH EDISON COMPANY
CHAIRMAN, BREEDER REACTOR CORPORATION

Mister Chairman, Members of the Subcommittee.

As Chairman of Breeder Reactor Corporation, I am honored to appear before this Subcommittee to represent the 753 electric systems nationwide from all sectors of our industry which support the Clinch River Breeder Reactor Project ("Project").

BRC is a non-profit corporation which was formed in 1972 when the Federal government invited our industry to join in the design and construction of the nation's first large-scale Liquid Metal Fast Breeder Reactor ("LMFBR") demonstration plant. The $325 million (including interest) which is being contributed to the Project by the nation's electric utilities and others include the largest contribution ever made by our industry to a single R&D project. We made this commitment because we saw development of the LMFBR as necessary for achieving the full energy potential of the nation's uranium resources. This potential is several times larger than our nation's combined resources of fossil fuels, and is one which can provide for our nation's electric power needs for the next century and beyond. Moreover, we were convinced then, as we are now, that construction and test operation of Clinch River is the logical next step in development of this technology.

Events of the past decade have underscored the importance of this Project and have reinforced the electric utility industry's conviction as to the need for timely completion of Clinch River.

In addition to my position with BRC, I also am Chairman and President of Commonwealth Edison Company. Our Company, along with the Tennessee Valley Authority, is a party to the Principal Project Agreements. As such, we are contributing managerial and technical expertise to the Project over and above our financial contributions. This role has given us a unique opportunity to assess the technical aspects of Clinch River's design, about which I will have more to say in a few minutes.

Gordon R. Corey, former Vice Chairman of Commonwealth Edison, will also testify today. He is serving as Chairman of the BRC Financial Advisory Task Force. This Task Force was convened in response to Congressional concern about the level of future Federal budget appropriations for the Project, and in response to a Congressional charge to the U.S. Department of Energy "to vigorously explore proposals including a reconsideration of the original cost-sharing arrangement, that would reduce Federal budget requirements for the Clinch River project or project alternative, and secure greater participation from the private sector." [1]

As Mr. Corey will explain to you in detail, the Task Force has fully met the charge of Congress. It has proposed a Plan which can attract significant private investment in the Project, thus reducing the Federal government's financial obligations.

Unlike most Federal R&D undertakings, the Project can repay a portion of its total cost. The Task Force proposes that this capacity to repay part of the cost be used to attract private investment and thus reduce Federal outlays. The Task Force Plan for private financing would provide forty percent -- or approximately one billion dollars -- of the DOE-estimated remaining 2.5 billion dollar cost of completing the Project. Because of the Federal R&D character of the Project, this financing will require governmental assurances of Project completion, its licensing, operation, and net revenues under the Plan. Private debt investments will be repaid out of sales of the Project's eventual electric output, and private equity investors will have the right to share in any net revenues remaining after debt service and operating costs, and in any residual value of the plant. Our industry fully endorses this Task Force Plan.

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[1] H.R. Rep. No. 980, 97th Cong., 2d Sess. 186 (1982).

For my part this morning, I will:

- report on the status of the Project;
- address the need to complete this national research and development effort from the utility perspective;
- explain the industry's continued role in Project financing, and the limitations facing the electric utilities in this respect; and
- urge the Congress to continue its commitment to breeder reactor R&D, including completion of Clinch River.

Progress of the Project

About $1.66 billion will have been invested in the Project at the close of the current fiscal year. Except for the delay costs attributed to the previous Administration's efforts to terminate the Project, this has been money well spent. Engineering and design is now over 90 percent complete. In the industry's opinion, the design is up-to-date and contains many features at the leading edge of world developments in this technology. More than 70% of the plant's components have either been received or placed on order, at a cost of approximately $740 million. Preliminary site preparation activities are well under way. Over one million cubic yards of dirt and one-half million cubic yards of rock have been removed and preparation of the site has advanced to where construction can begin this fall.

A Nuclear Power Stabilization Agreement has been concluded with the building trade unions so that progress can proceed on schedule unimpeded by labor disputes. A construction permit from the Nuclear Regulatory Commission is expected this fall. All interventions in agency proceedings have either been resolved in the Project's favor or withdrawn. The hearings for issuance of a construction permit were uncontested.

By completing Clinch River, the U.S. will be well on its way to developing an effective breeder option for the twenty-first century, thereby acquiring a capacity to achieve the future energy independence that both our nation's economy and security require.

Need for the Project

The development of breeder reactor technology has been a national goal for more than 30 years. It is one of several current Federal R&D programs in our nation's efforts to anticipate and meet America's future needs for electric power. At present, the breeder option offers the most promise among the advanced energy alternatives for application beginning in the early part of the next century. Yet the United States is still several steps away from commercialization of this energy source. Clinch River is the most important step in that direction, and one that must be taken now if the U.S. is to be sure of having the breeder option available when it is needed.

The Clinch River Project is the only technically acceptable, economical, and timely demonstration plant available to the United States for these purposes. It is the focal point for the LMFBR base technology program. Component testing is important, but full system testing at Clinch River in a utility environment is essential to establish needed engineering benchmarks and to prove the ultimate practicality of the technology. Without Clinch River, the LMFBR base program, the LMFBR technology, and, ultimately, the nuclear option for future domestic power supplies will be grievously threatened and may be foreclosed from future generations of Americans.

Those of us who are responsible for America's future electric power supplies believe America must have a high confidence strategy. We must pursue scientific research on a broad basis and concentrate on developing those concepts within our nation's grasp, such as the LMFBR, with the most significant potential benefits. To abort the Project at this point would be irresponsible, wasteful, expensive, and short-sighted. To do so would be a signal to the whole world that America is no longer serious about preserving a nuclear power option and reducing our long-term dependence on petroleum fuels.

One has to wonder why we fail to pay the same regard to inner space as we do to outer space. For example, the fiscal year 1984 Appropriations Act for the National Aeronautics and Space Administration, Pub. L. 98-52, provides $5.9 billion in research and development funds: the House Committee on Science and Technology recommended that the Space Shuttle alone receive $1.6 billion, and the Space Lab $120 million.

These authorization bills typify the national commitment towards space research and development, which, like breeder reactor R&D, initially lacked a commercial character. As Representative Carney observed, "there is an attitude prevalent on [the Science and Technology Committee] that it is unpatriotic to question budget requests for space."[2] The growing gap between commitments for energy R&D and space R&D is difficult to understand, particularly in view of the parallels between the two programs.

Both breeder reactor and space R&D involve long-term and high-risk technological development of concepts for which government must assume primary responsibility. Private industry can carry the financial burden only as those concepts approach economic and commercial viability.

Both breeder reactor and space R&D have the potential to provide vast benefits; both directly, and through the spill-over effects which advanced R&D have for the nation's economy. Both breeder reactor and space R&D are intended to enhance the national well-being. They both look to the private sector ultimately to develop for commercial purposes the most promising elements of the advanced technology acquired. Unfortunately, however, our nation's advances in energy R&D have been falling well behind those which we have made in space.

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[2] H.R. Rep. No. 65, 98th Cong., 1st Sess. 210 (1983).

Government involvement in the Clinch River Project is not a subsidy to our industry nor a betrayal of the Administration's free-market philosophy. Quite the contrary, it is a practical manifestation of the respective roles of government and industry in a national research and development project. No one characterizes the space program as an industry subsidy, nor should Clinch River be regarded as such. Indeed, the prime beneficiaries of the Clinch River Project will be the U.S. public -- not the nuclear utilities or their stockholders, who will receive no direct financial gain therefrom.

The CRBR Project represents research and development having significant potential payback in commercial terms well into the future. But it also possesses important near-term advantages, such as those involving long-range supply assurances and positive international benefits.

The report of the Committee on Nuclear and Alternative Energy Systems (CONEAS) of the National Academy of

Sciences,[3] notes that "this intensive effort to develop and demonstrate breeder technology does not imply a corresponding commitment to deploying breeders." Nevertheless, if the very option to deploy the liquid metal fast breeder reactor is to be available to this country in the first half of the next century, a demonstration of current breeder reactor technology must proceed now. Clinch River will preserve the industrial infrastructure and workforce assembled and trained over the past three decades and upon which eventual deployment of the breeder reactor will depend.

Given the decades of lead time that will be required for the construction and operation of a commercial-size prototype and the ultimate commercialization of the technology, Clinch River must be undertaken now. Estimates vary, yet even optimistic figures indicate that commercial breeder reactors will be unavailable until after the year 2010, even if current progress is maintained and the Clinch River demonstration plant is completed on schedule. As Dr. Alvin M. Weinberg of the Institute for Energy Analysis at Oak Ridge observed in his testimony before Congress on

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[3] Energy in Transition 1985-2010 (Final Report of the Committee on Nuclear and Alternative Energy Systems, National Research Council), National Academy of Sciences.

February 23, 1983, "[i]f we have 50 years before breeders are needed on a large scale we do not have all that much time to wait."

The Department of Energy's Nonproliferation Alternative Systems Assessment Program,[4/] conducted over a period of three years at a cost of $23.5 million, reached a similar conclusion. Its 1979 report concluded that even with aggressive research and development and a timely demonstration project, the widespread commercialization of breeder reactor technology in the United States could occur no sooner than 2010. NASAP consequently urged completion of the demonstration plant at Clinch River, in order to avoid a further delay in the availability of the breeder option.

Financial Contribution of the Electric Utility Industry

Although the electric utility industry as a whole is contributing $325 million, including interest, to the Project, this contribution was never intended as a match for federal funding. As mentioned earlier, this is the largest R&D commitment ever made to a project by our industry.

[4/] Nuclear Proliferation and Civilian Nuclear Power, DOE Report of the Nonproliferation Alternative Systems Assessment Program, Executive Summary, DOE/NE-0001, December 1979.

I regret that the electric utility industry is effectively prevented by our nation's system of State Public Utility Commission regulation from making additional large contributions from ratepayers in support of R&D programs which have only very long-term payoffs.

One reason for this is the fact that some areas of the country, and some companies, are more heavily involved in nuclear power generation than others. Thus, there is no feasible way through voluntary action to apportion financial responsibility for broad scale nuclear research and development facilities such as the CRBR project. Another reason is that utility rates have an extremely high profile, and since rate increases encounter great public resistance, utility commissions are loath to authorize contributions for large-scale development projects at consumer expense. Moreover, given the beleaguered financial condition of the electric utilities, it simply is unrealistic to look for larger contributions from stockholders.

If the industry consisted of only a few large systems with a more or less equal stake in nuclear power and without close and itemized regulation of rates, financing a project such as Clinch River would not be a problem. Similarly, if the electric power industry were nationalized, as in England and France, there is little doubt that the

Federal government would recognize that it could not fail to keep the United States at the forefront of nuclear technology, especially breeder technology. Notwithstanding these considerations, and indeed (in part) because of them, the government simply cannot afford to look at the problem of future energy sources from a short-term limited perspective. After all, it is the government to which the public must look to protect the interests of America's future generations.

While the electric utility industry is in no position to increase its monetary contributions, it remains anxious to do all it can to promote continuing development of this very promising concept. To this end, a number of individual companies and several electric cooperatives have indicated a willingness to purchase electrical output from the plant at their avoided costs. These commitments are a vital part of the Task Force Plan. The industry also recognizes that overseas collaboration may be essential to mitigating the high costs of the subsequent full scale demonstrations that will follow Clinch River. As we see it, Clinch River will give the U.S. unique technical information which will be critical to striking suitable multi-national collaborative agreements for sharing the cost of the larger near-commercial demonstrations that must follow this Project.

Need for Continued Congressional Support

Cooperation between the public and private sectors has produced large payoffs for consumers in the past, especially in the development of advanced technologies with great promise where the risks and costs are beyond the capacity of private industry to assume alone. Success has been particularly apparent in the area of civilian nuclear power. An example is the earlier cooperative effort between government and industry to develop the light water reactor, a technology which the Atomic Energy Commission developed in the 1950s and which the industry commercialized in the 1960s. Five billion dollars in government support for research and development have resulted in industry investment of 150 billion dollars, and immeasurable benefits to society in terms of energy cost savings, security and independence. Clinch River is a logical extension of this strategy.

Since the beginning of Clinch River, the electric utilities pledging their support for the Project have remained faithful to their commitments despite the past political controversies and uncertainties which have surrounded it. These utilities remain committed to seeing the Project through to completion. The current Congressional debate regarding continued funding of the Project will test the resoluteness of the government to fulfill its commitment to the national objectives which the Project represents.

Conclusion

In concluding, I thank you for permitting me -- on behalf of our nation's electric utility industry -- to report on our assessment of the progress to date, and to stress the continuing need for this vital national research and development effort. This nation has wisely committed itself to maintaining a nuclear option. The breeder reactor remains the keystone of that option as well as a symbol of our nation's commitment to a responsible energy strategy for the next century and beyond.

As a practical matter, it is our nation's only straight path to maintaining a nuclear energy option, attaining energy security, and sustaining economic strength.

Let me conclude by recalling President Reagan's remarks contained in his Nuclear Policy Statement of October 8, 1981:

> One of the best potential sources of new electric energy supplies in the coming decades is nuclear power. The United States has developed a strong technological base in the production of electricity from nuclear energy. I am directing that government agencies proceed with the demonstration of breeder reactor technology, including completion of the Clinch River Breeder Reactor. This is essential to ensure our preparedness for longer-term nuclear power needs.

Thank you.

The CHAIRMAN. Mr. Potter.

STATEMENT OF FREDERICK S. POTTER, VICE PRESIDENT, MERRILL LYNCH CAPITAL MARKETS, NEW YORK, N.Y., ACCOMPANIED BY JOSEPH G. SAUVAGE, VICE PRESIDENT, INVESTMENT BANKING DIVISION, LEHMAN BROS. KUHN LOEB INC., AND MR. OLIVIA, VICE PRESIDENT, SOLOMAN BROS.

Mr. POTTER. Thank you, Mr. Chairman.

I'm vice president at Merrill Lynch where I specialize in utility finance. With me today is Joseph Sauvage who is vice president of Lehman Bros., and—Olivia who is vice president at Soloman Bros. where he specializes in government finance.

Merrill Lynch along with these firms and Morgan Stanley helped the Breeder Reactor Corp. prepare an alternative financing plan for the Clinch River project. As members of the task force which prepared the financing plan, we took an active role in the task force deliberations related to the financial considerations.

The financing plan is designed to reduce direct Federal Government contribution for the project and to increase private sector financial participation in the project. The economics of the financing plan depends to a large extent on the capitalization on the future income stream from the sale of electric power from the project. That future income stream has a present value which we believe can be financed in the marketplace provided that certain Federal Government assurances are available.

The plan provides for a combination of debt and equity totaling $1 billion of private capital toward the cost of construction, or 40 percent of the estimated cost to complete the project. In addition an estimate of $365 million will have to be spent for interest during the construction period. We believe that this is the maximum amount of financing which the project's projected revenues can support.

The plan provides that the Government will provide credit support for the financing. We believe that the form and amount of such credit support is the minimum needed to raise the $1 billion of private sector capital for this project. The plan provides for no special tax incentives but rather relies strictly on tax benefits available under existing law. And moreover, such tax benefits are related only to that portion of the project to be financed by the private sector.

The plan provides for private investors to take the same market or capital risk generally associated with private financing. On the other hand the plan provides that the Government will continue to assume the project risks comparable to those generally assumed by sponsors of the project financings. Project risks such as failure of the technology to operate, its design, subsequent obsolescence of the technology, or the failure of the project to continue to operate for its expected life.

That's all I have.

[The prepared statement of Mr. Potter follows:]

STATEMENT

OF

FREDERICK S. POTTER
VICE PRESIDENT
MERRILL LYNCH CAPITAL MARKETS

Introduction

My name is Frederick S. Potter. I am a vice president in the investment banking division of Merrill Lynch in New York. By way of introduction, I have been involved in activities relating to corporate finance since graduating from the Columbia University Graduate School of Business in 1971. For the past six years I have been with Merrill Lynch, where I specialize in utility company finance. My background includes positions as financial advisor with the Department of Treasury concerning financing an Alaskan Natural Gas Transportation System and with the U.S. Railway Association concerning the initial financing for ConRail.

In order to assist the Breeder Reactor Corporation prepare an alternative financing plan for the Clinch River Project, four major investment banking firms helped to develop an approach to the capital markets which would reduce direct Federal government appropriations and outlays for the project and increase private sector participation. Representatives of Lehman Brothers Kuhn Loeb Incorporated, Morgan Stanley & Co. Incorporated, Merrill Lynch Capital Markets, and Salomon Brothers Inc. took an active role in the deliberations and planning of the Task Force, as they related to financial considerations. The plan which has been presented to you is in response to the 1982 Congressional mandate which directed the Department of Energy "to vigorously explore proposals including a reconsideration of the original cost-sharing arrangement, that would reduce Federal budget requirements for the Clinch River project. . .and secure greater participation from the private sector."

The banking group welcomes this opportunity to present its views to this committee and we appreciate the invitation which you have extended to us. We will endeavor to respond to your questions and we hope by this presentation to satisfy you that the financing plan is workable, that this participation by the private sector is the maximum which can be achieved, and that the safeguards and assurances requested in the plan are the minimum needed to bring in the large amount of anticipated private capital.

Determining Economic Value

The following considerations were taken into account in the development of the financing plan:

1. The 1982 Congressional mandate which directed the Department of Energy "to vigorously explore proposals including a reconsideration of the original cost-sharing

> arrangement, that would reduce Federal budget requirements for the Clinch River project ... and secure greater participation from the private sector";

2. The fact that substantial Federal funding would be required because the projections of net revenues from the sale of the electricity produced by the project were inadequate to support private sector debt financing in excess of $1 billion; and
3. The fact that the project was fundamentally a research and development effort and that, without appropriate undertakings from the Federal government, private financing would not be available for the project.

The plan involves complex tax, regulatory, legal, and credit support issues. A favorable resolution of these issues will be a prerequisite for its success.

The economics of the plan depend to a large extent on the capitalization of the future income stream from the sale of electric power from the project. That future income stream has a present value which we believe can be financed in the market place, provided that certain Federal government assurances are available. A study was made by outside consultants of the probable prices for electric energy in the project's region over its useful life. Assumptions were made of the probable output of the project. Based upon various regional studies, a market for that output was also projected. Together, these provided a measure of the future income stream which would be available to service and repay the private debt, and thereby established the maximum amount of debt financing which the project could support from forecasted revenues.

The figures are contained in the plan before you. Of course, a number of assumptions have to be made in a projection of this sort. Mr. Corey in his testimony explains the basis for the assumptions used. Among the major ones, on which opinions may differ and events may change, are:

1. The level of output from the plant (load factor);
2. The future market price for the output;
3. Operating expenses; and
4. The cost of debt capital.

Form of Organization

Our plan recommends a joint venture arrangement rather than a joint public-private corporation such as Comsat. In this way the capital market financing will not be made through a government or quasi-government agency.

The private portion of the joint venture would be a partnership of private investors in order to pass through to such investors the direct tax incentives which will be utilized to attract equity capital into the project. As is often the case in project financings, it is contemplated that construction would be financed by equity contributions and bank loans, with the loans funded long term either in segments from time to time or completely when the project is finished and operating.

The $175,000,000 research and development contributions by the participating utilities would be made in accordance with the original planning, and are in addition to the $150,000,000 which the utilities have already contributed for such purpose and for which no return is to be paid. These R&D contributions constitute private sector participation in financing the project. However, utilities making the R&D contributions will neither benefit from the Federal government safeguards and assurances to be provided to the private debt and equity investors, nor share in any investor returns from the project.

In the opinion of representatives of the utility industry on the Task Force, the utility industry could not be called on for additional financing. The reason for this is that the entire atmosphere of utility rates and rate regulation has changed since the original commitment was made. Neither state regulators, who would have to authorize rate increases to pay any additional contribution, nor shareholders, whose returns are already depressed, seem likely to approve further funding. Presently, when utility rates have a high profile and rate increases encounter great public resistance, utility commissions are unlikely to authorize contributions for any such long term large-scale development projects at consumer expense.

In fact, under these circumstances, the utilities' willingness to stand by their original commitment, despite a severe deterioration in the financial condition of the industry, provided that the government will fulfill its own commitment to complete the project, is evidence of their good faith and of their support for the need for this technology.

Cost and Sources of Capital

The plan provides for $1 billion of private capital toward the cost of constructing the project, or 40% of the estimated cost to complete of $2.5 billion. In addition, an estimated $365,000,000 will have to be spent for interest during construction on the debt portion and on financing costs; thus, the actual amount of private funding will be $1,365,000,000. The partnership will be capitalized with $1,040,000,000 of debt and $150,000,000 of equity. With the addition of the further $175,000,000 to be contributed by the utilities, the total private sector participation comes to $1,365,000,000.

Accordingly, the revenues will have to support $1,040,000,000 of debt. The plan envisions a debt maturity of 30 years, and for planning purposes we utilize level debt service commencing with the date of operation.

There are several ways for assuring sufficient revenues to service this debt. One method we propose is that the Federal government, acting through the Department of Energy, enter into a power purchase contract to assure the timely payment of the principal of and the interest on the private debt. We also propose that any payments by the Department of Energy, pursuant to this contract, resulting from shortfalls, if any, in net revenues from resale of the power into the market, be treated as a loan to the project, to be repaid as soon as practicable thereafter from project revenues. Once profitability has been reached and project reliability established, it should be possible for the government to begin to recoup part of its R&D costs from its share of the revenues of the joint venture and from its interest in the residual value of the plant after the debt has been amortized.

A key component of this financing plan is the equity investment of $150,000,000. No part of the revenues from electric sales will go to equity investors until the plant reaches the break-even point. The equity would then begin to earn a cash return only if the sales of electricity bring in sufficient revenues. The equity investors would also have a share in the post-amortization residual value. These investors will be attracted by tax incentive benefits but there must also be a business purpose for the investment. This business purpose would be the earned return from a successful, revenue-producing project and the equity investors would take the risk that earnings might be insufficient, after covering debt service, to provide any cash return to them. The plan does not guarantee any cash return to the equity investors. That is a risk they will be expected to take. We are recommending that any revenues remaining after the payment of operating expenses and debt service and residual value be shared by the equity investors and the government based on the ratio of the total private investment to the total cost of the plant. It should be noted, in any case, that the profit potential, if any, would be limited since the sales price of the output will be set by the competitive cost of alternative energy in the area.

The debt instruments will have a senior lien on the revenues of the project after operating costs. In order to broaden marketability of this debt, the objective will be to make its terms as conventional as possible. The debt may be sold publicly if the plant is operating and if there is a good public market at the time. On the other hand, the debt might be placed directly with institutional investors if a lower cost of money or better terms can be obtained or if other conditions warrant. We obviously need to have the flexibility to adjust to market conditions, which will dictate the maturity of the debt, the security provisions required, the interest rate, other terms and conditions and the timing of sales to take advantage of market conditions.

Raising over $1 billion of debt is a sizeable task. It is essential to design a debt instrument with the broadest appeal, not only to institutions which are the major purchasers of debt, but also to individuals if a public offering can be made. We have no doubt whatsoever, given the enactment of the proposed legislation, the negotiation of a satisfactory power contract with the Department of Energy, and suitable terms on the debt instruments themselves, that it will be possible to raise $1 billion from the markets on highly satisfactory terms.

The interest on this debt would be taxable, as would any cash return on equity and any profits realized by the equity investors from the disposition of their investment.

Investors in debt instruments are accustomed to taking a market risk, but they will not take project risks associated with large projects of untried technology. By "market risk" we mean the risk of changes in interest rate levels, as well as the inflation rate, which erode the value of investments. The experience of the past decade shows these risks to be very real.

By "project risks," we mean risks such as, but not limited to, the failure of a new technology to operate as designed, the subsequent obsolescence of a new technology, or the failure of a project to continue to operate for its expected life. Investors will not, and those who are fiduciaries may not, knowingly invest in an unproven venture. They must have reasonable assurance, enough to satisfy a prudent man, that the project will be completed and that it will operate over the term of the debt so that there will be a revenue flow to service and repay their loans. In order to attract these investors, the following basic assurances are required:

1. That the project will be completed and that it will operate and produce sufficient net revenues to service and repay the debt;

2. That it will be licensed to operate and will be allowed to operate during the term of the debt; and

3. That should there be any change in government policy which results in the project being terminated before completion, or abandoned after completion, failed to be licensed, closed down, or otherwise rendered inoperable, this would be viewed as a property-taking by the government and the outstanding principal amount of the debt would be accelerated and repaid.

With these assurances, which would be contained in the power contract with the DOE, the unique nature of the project for financing purposes will be minimized and the debt securities will be marketable in competition with conventional financings in the private sector capital markets.

The CRBR will undergo the normal review and approvals by the Nuclear Regulatory Commission at the appropriate stages of the licensing process. The financing plan does not seek any Congressional waiver of licensing requirements.

Turning to the equity component, we do not believe that the equity can be sold as a new issue of common stock in the public market. There is no likelihood of significant future profits for the equity investor such as those which spur interest in the securities of new technology companies today. This will be a single, finite project with little prospect for growth or even of a proprietary right to inventions made in the course of the project. Return on equity will be constrained by, among other factors, the cost of alternative energy in the service area. Moreover, the equity investor would have to undergo the risk of long years of construction before he could begin to expect any operating profits to accrue and, even then, profits would be uncertain. The CRBR Project has an unfortunate history of governmental vacillation, controversy, and uncertainty. Thus, a public stock offering to provide the initial equity investment is out of the question.

The tax benefits available under existing tax law, however, provide an incentive for certain investors to commit equity to the project. Some of the tax benefits from the project would begin to be realized almost immediately. The major tax benefit would be the investment tax credit. It is also likely that interest during construction will be deductible on a current basis, although this might have to be capitalized and depreciated commencing with the date of operation. The important benefit of accelerated depreciation would be deferred until commercial operation a number of years from now, which would reduce the present value of these deductions to the equity investors. This deferral reduces the attractiveness of this project to potential equity investors, particularly since most equity investors are not accustomed to committing funds so far in advance of commercial operation and, hence, usually have the accelerated depreciation deduction more immediately available.

An IRS ruling covering the application of existing Federal tax law to the facts of the financing plan will be required prior to equity investors actually advancing funds.

We want to emphasize, as the plan clearly states, that no special tax incentives are being requested. The project would be relying on existing law and would compete in the market place without any special tax advantage. It would utilize only existing provisions of existing law, as they are applied by the Internal Revenue Service and which are available to everyone on an equal basis.

The rate of return to an equity investor in the project will come from the tax benefits anticipated to be available under current Federal tax law, cash flow from operations, and residual value. Due to the uncertainty of the timing and magnitude of cash flow and residual value, these equity investors will be looking towards the anticipated tax benefits to provide the minimum required rate of return of their equity investment. Therefore, in addition to the IRS ruling covering the availability of the anticipated Federal income tax benefits, the following assurances will be required to successfully market the equity:

1. Indemnification against changes in Federal tax law and regulations, subsequent to the equity commitment by the investors and prior to the commercial operation of the project; and
2. Indemnification against the failure to complete or operate the project, which would assure to equity investors the return of their outstanding investment, net of adverse Federal income tax consequences.

Our proposal would not protect the equity investors against the loss of cash flow or residual value.

There is, however, one change in existing law needed to market the equity. The equity partners will have to be given exemption from the Public Utility Holding Company Act of 1935 ("PUHCA") if they would otherwise become subject to the Act by reason of their purchase of equity in the partnership. It was certainly not the intention of the PUHCA to make registered holding companies of investors in a single project of this sort, when they are otherwise not engaging in any of the activities that the Act seeks to regulate. In our opinion, the risk of regulation under the PUHCA of 1935 would inhibit otherwise willing equity investors from participating in the project.

Thank you for your interest and attention. The other investment bankers here and I are prepared to respond to any questions you might have on the financial plan for the project.

The **Chairman**. Thank you very much.

We'll next hear from Mr. Hobelman. I understand Mr. Corey has not yet arrived.

STATEMENT OF CARL HOBELMAN, LEBOEUF, LAMB, LEIBY & MACRAE, ACCOMPANIED BY R. TODD VIEREGG, SIDLEY & AUSTIN

Mr. **Hobelman**. Mr. Corey has arrived and will shortly take my place. But before he takes my place I'd like to present a short statement.

The plan has been criticized in some quarters as not having reexamined the current arrangements as to whether or not any other possibility of a financing proposal might be developed. I'd like to assure the committee that the task force which has been working on this proposal since January has, in fact, investigated any number of other alternative sources of funds.

The first thing the task force did was consider what assets might be available to the project and how they might be best utilized to insure project funding in the private sector. That consideration included consideration of increased utility contributions, consideration of such aspects as the sale of patent rights, and through a request of DOE consideration of whether or not foreign contributions might be available. The only practicable plan was developed and a very practicable plan it is according to our investment banking friends. It's the plan which has been presented to you here today.

If the Government completes the plan and goes forward with construction, it controls construction; there is no reason to believe that the revenue stream to be derived from the plan cannot support fully the debt issued and result in no payments by the Government on the assurances that have been requested.

I appreciate the opportunity to speak and I'm going to surrender my place to Mr. Corey who is far more qualified to discuss the plan than I am.

The **Chairman**. Thank you.

Mr. Corey.

STATEMENT OF GORDON R. COREY, FINANCIAL CONSULTANT AND RETIRED VICE CHAIRMAN OF COMMONWEALTH EDISON CO., CHICAGO, ILL., ACCOMPANIED BY FRED HICKMAN, HOPKINS & SUTTER, CHICAGO, ILL.

Mr. **Corey**. Thank you very much.

I'm sorry I'm late. This is Murphy's Law, I guess, not O'Connor's law. My flight was canceled this morning.

We in the BRC task force were asked to develop a plan to significantly reduce the Government's cost of funding of the R&D project. We have done just that. We have provided a plan under which about a billion dollars of the Clinch River project cost can be paid for by maximizing the commercial value of the project. This, I think, is the essence of the whole problem. How can we maximize the commercial value, how can we maximize the output, how can we get the greatest price for it, and how can we then give to the

Government maximum value to offset the cost of this large R&D project?

The remaining cost of funding the R&D portion of the project has been reduced to about $1 million net spread over 7 years, represented by the $1.5 billion multiyear appropriation we are requesting, less approximately a half a billion dollars in cancellation costs and secondary losses related thereto. The essential question before this committee and the Congress is whether this important R&D project is worth a billion dollars. It's just that simple.

It seems to me to be foolish and time consuming to spend our time debating irrelevant issues such as whether or not the equity participation we proposed makes sense. This is because we propose to sell these participations in a competitive market for the highest price they'll bring. There will be no windfall for the investment bankers and there certainly will not be a 37-percent return on investment as suggested by the CBO report.

Second, no special tax benefits are involved in our plan. This is not a complex tax leasing scheme as has been alleged.

Third, with a favorable tax ruling which allows 5-year ACRS depreciation instead of 10 and allows expensing of interest during construction instead of capitalizing it we'll probably sell $250 or $300 million of equity in the market.

As I testified before Mr. Ottinger's Subcommittee on Energy Conservation and Power a few days ago, we considered suggesting a $250 million equity figure in the beginning and I decided against it on the grounds that I didn't want to come back to Congress hat in hand if we got a bunch of unfavorable tax rulings. But if we get favorable tax rulings, we'll sell more equity.

But this tax benefit, this equity participation question, is a side issue. It is not central to our plan. If Congress prefers an all-debt plan with no tax benefits and no equity participation, let's go ahead and adopt such a plan. We can increase the amount of debt by $150 million and eliminate the new equity participations. The consequences will be quite simple. It will just take a little longer to pay off the bonds because less excess revenues will be available to retire the bonds early and to eliminate the Government's contingent liabilities—period.

Now let me turn to the Congressional Budget Office report which we received just a few nights ago. I appeared on Tuesday, I guess it was before Mr. Ottinger's committee. I had come into town the night before and found a draft of the CBO report in my hotel. I never have seen the final. I got up at 4 a.m. and started looking it over, and we still have, we're still looking at it, but I would like to say that I was not shown anything in advance. I did not know the CBO was working on this. No one from there consulted with us and as a result they have produced a misleading document which draws erroneous conclusions.

First, as to sales outside the TVA area, they recognize, properly, that an essential part of our plan is to maximize project revenue, but they ignore the difficulty of enacting legislation which would permit federally owned Clinch River power to be sold to private utilities outside the TVA area. I testified on this before, several times.

The question is not, as the CBO suggested, whether the existing 5-year TVA power sales agreement can be abrogated. Of course it can be abrogated. Instead, it's whether in view of longstanding political considerations in the Tennessee Valley area, it would ever be feasible to sell federally generated power from Clinch River outside the TVA area. To propose at this time, out of the blue, broad legislative action to permit such sale would be opening Pandora's box. There would be allegations from the private sector that restrictions on TVA expansion embodied in the TVA act were being abridged. There would be screams from municipalities in the TVA area that their right to federally subsidized power was being withdrawn.

While it would certainly be possible to draft legislation to accomplish such an end and to allow such action—I told Congressman Ottinger, in response to a question, that it would certainly be possible to devise such legislation but it would be extremely difficult and time consuming to enact, and, indeed, it would seem to me that the very Congressmen who give lipservice to the idea would oppose the legislation.

On the other hand, under our plan the desired result, to sell CRBR power to the highest bidder wherever and whoever he may be, would be accomplished easily and almost automatically.

Second, with respect to the Congressional Budget Office plan, they ignore the efficiency incentives involved in our plan. The CBO conclusion was essentially that there would be a rather modest savings to the Government under full Federal funding, savings growing mainly out of lower Federal interest costs than the interest costs to the private sector. No question the Government can borrow money more cheaply than the private sector, but that does not mean that Government operations are always the most commercially successful.

The CBO report assumed identical output and operating efficiencies under Federal funding as under the private financing plan, except, interestingly enough, for case number six in which they assumed for some unexplained reason that the Federal bureaucracy would be more efficient and provide greater output than under the private plan we had proposed. I suspect that the reason for case number six was to show that it was possible somehow to manipulate the figures so the sale to TVA wouldn't look so disadvantageous to the Government.

All this flies in the face of commonsense. The necessary conclusion that all our industrial and commercial activities will be cheaper and more successful if federally funded is nonsense. Does Mr. Penner or Mr. Ottinger or anyone else who supports this idea really believe that our electronic industry could compete better with the Japanese if financed with Federal funds and organized under a Federal department with every move being overseen by three or four congressional committees?

By ignoring my testimony the 20 percent less energy will be made available for sale under full Federal funding. And I went into this at great length in testimony presented here to this committee which I hope incidentally will be accepted for the record, Mr. McClure.

The CHAIRMAN. It will indeed. It will be placed in the record in full.

Mr. COREY. By ignoring that testimony the CBO made a second error.

Third, they used inappropriate discount rates. This is a complex technical question but it's vital to the CBO analysis. Had they handled this matter differently the results would have been different.

Let me explain. I have been chief financial officer prior to my retirement, for about 25 years at Commonwealth Edison. I've been vitally concerned with the use of present value discount rates and making economic analyses. I was involved in the Resources For The Future study a few years ago with several Nobel prize winners and others to try to determine the appropriate present value discount rate for making Federal decisions—long term social decisions. The thing that makes it so difficult is that nobody really understands present value discount rates. They are really a method of reflecting the fact that a bird in the hand is worth two in the bush. They reflect the cost of postponing the use of money.

Small changes in present value discount rates can have a large effect on the present value comparisons, and those shown in table 3 of the CBO report are extremely sensitive to the discount rates used. The CBO study used present value discount rates of 6.75 and 7.5 percent per annum, reflecting market rates, market costs of money of 9 percent and 10 percent, but reducing these market rates by taxes collected on the investment return. This makes to me no sense at all. Use of a present value discount rate which reflects taxes collected on the interest itself seems intuitively to be wrong.

Suppose for example that a tax of 100 percent were levied on all interest income, would this mean that the discount rates would be zero and hence the present value of something 40 or 50 years hence would be the same as today? To assume that raising taxes will per se reduce the discount rate, reduce the penalty for delayed use of funds, and increase the present value of a future income stream, is nonsense.

For example, the individual taxpayer who may be paying 14 percent on his mortgage, that his government—hence he himself—needs to be paid only about half that much on its own funds primarily because of the collection of taxes on those funds by the Government is likely to get a decisive answer. It is a fundamental error to apply a discount rate to future Government income which has been reduced by whatever taxes the Government chooses to levy. If CBO had used a 9 or 10 percent rate instead of a net after-tax rate of 6.75 and 7.5 percent, this would have reversed a number of the relationships shown in table 3.

At any rate, this gets me to the end of my discussion on the CBO report.

I'd like to try to pull all this together.

I have prepared a statement which I wrote out on the airplane. We just filled it in with some figures the boys were working on last night it's entitled "CBO's table 3, Cost to the Government adjusted to reflect assumptions embodied in the BRC plan."

This statement shows that there is a significant advantage to the Government, not a disadvantage, under the BRC plan. I would like to have some way to introduce this for the record, but I haven't had a chance since I left the plane to photocopy it.

The CHAIRMAN. We will see that it is copied. It will be made part of the record.

Mr. COREY. In that connection I'd like to say I put a note on this paper. "All figures shown are approximate subject to change."

In the 2 days or so since we first saw a draft of the CBO report we have not had time to make a disciplined check of all computations. Believe me, we will make that in the next few hours.

Thank you very much.

[The prepared statement and additional comments of Mr. Corey follow:]

STATEMENT OF GORDON R. COREY, FINANCIAL CONSULTANT AND RETIRED VICE CHAIRMAN OF COMMONWEALTH EDISON CO.

My name is Gordon R. Corey. I live at 2511 Park Place, Evanston, Illinois 60201.

I am a financial consultant. I am also a director and member of the executive and finance committees of the board of directors, Commonwealth Edison Company, by which I was employed for forty years prior to my retirement on October 1, 1979; a director, member of the directors' audit committee and chairman of the nominating committee of Inland Steel Company; a director and chairman of the finance committee of Perkins & Will, Inc., an architectural firm; and a director of NUKEM, Inc., a nuclear fuel supply, service and brokerage firm. Until early last year, I was also a director and chairman of the directors' audit committees of the Continental Illinois Corporation and the Continental Illinois National Bank and Trust Company of Chicago.

I am chairing the BRC task force to develop plans for private funding of the Clinch River Breeder Reactor Project. In connection with that work, I am also serving as President of American Energy Development Corporation, an entity formed to assist in the financing, construction and operation of the Clinch River Breeder Reactor Project.

I. BACKGROUND

On December 20, 1982, Congressional Conferees approved fiscal year 1983 funding for the Clinch River Project requiring the U.S. Department of Energy "to vigorously explore proposals, including a reconsideration of the original cost-sharing arrangement, that would reduce Federal budget requirements for the Clinch River project or project alternative, and secure greater participation from the private sector."* The DOE was directed to submit its findings to the cognizant Congressional committees not later than March 15, 1983.

In view of the action of the Conferees, a Task Force established by the Breeder Reactor Corporation (BRC) prepared a report, exploring possible project financing proposals. This report, dated March 12, 1983, was submitted to the cognizant Congressional Committees by the Secretary of Energy on March 15, 1983.

On June 23, 1983, the Task Force prepared a second, more detailed report which was submitted by BRC to the Secretary of Energy on June 29, 1983. This report was in turn submitted to the cognizant Congressional committees on August 1, 1983. It responded to requests for specific details regarding the financing plan.

Our second report sets forth a specific proposal ("the Plan") for raising $1 billion in the private capital markets. The Plan was prepared by the Task Force, including the four investment bankers who are members of the Task

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* H.R. Rep. No. 980, 97th Cong., 2d Sess. 186 (1982).

Force. We believe Congress is getting just what it asked for in that proposal, which provides $1 billion that will never have to be paid by the Federal government, if it constructs and manages the Project as anticipated. Indeed, the Plan will result in an actual reduction in Federal expenditures, not just a "rearrangement" of the Federal financing role.

II. THE FINANCING PLAN

The details of the private financing plan, which provides a net of $1 billion towards the direct cost of constructing the Project, are set forth in our June 29 report which has already been made available to this Committee.

In considering these details, one should always keep in mind that the Plan is a judgment, based on the cumulative experience of Task Force members, as to the approximate amount investors in the open marketplace should be willing to pay for certain saleable assets in the total breeder reactor complex, providing those assets are packaged for sale in the optimum manner. It is an investment banking planning document, not an analysis of a completed transaction. Figures are forecasts and approximations. Individual figures within the total plan may turn out ultimately to be different, although particular changes are often offset by contra changes in other items. (See, for example, the discussions of interest rates in Section G below.) No one can look even ten years into the future without encountering major uncertainties. The Task Force believes, however, that its estimates and approximations are conservative, in the sense that they contain adequate allowances for uncertainties. It is comfortable with its conclusions, provided it is understood that it is dealing in approximations of what the marketplace will ultimately do.

As indicated in the financing illustration shown in that report, total private financing of approximately $1.365 billion will be raised, on the assumptions shown. The $1 billion figure breaks down as follows:

	Millions
Proceeds of 30-year bonds issued in 1990	$1,040
New equity participations	150
R&D funds already committed by utilities and others, including interest (in addition to about $150 million already paid in)	175
Total private financing	$1,365

Of this amount, $1 billion will be available to pay direct construction costs. The remainder will be used for interest during construction and financing costs.

The June 29 report provides many details regarding the Plan and the procedures for implementing it. My testimony and that of the investment bankers represented here today will provide further details. Finally, there will be additional details which can be worked out only as the financing documents are developed and the securities are marketed.

Based upon my experience of approximately 20 years as Chief Financial Officer and later Vice Chairman of Commonwealth Edison Company, I believe that we have developed a viable plan which will produce significant financial support for the Project.

Our first financing move will be to establish lines of credit for construction funds to be taken down as required to facilitate optimum construction scheduling.

These funds will be repaid, together with accumulated interest, from proceeds of the sale of bonds from time to time during the construction period or after the Project is finished and operating.

We plan to obtain new equity funds through the sale of equity participations as soon as practicable after approval of the Plan.

Funds already committed by utilities and others will be drawn down as required.

Outline of My Proposed Testimony

Our financing proposal has been described in detail in the two Task Force reports, especially the June 29 report. Testimony submitted by Frederick Potter on behalf of the four investment banking firms provides further details as to how the money would be raised. It is not my intention to duplicate Mr. Potter's testimony, but to deal with other matters, including how our proposal would be implemented. Hence, it is my intention to deal herein with revenues, contingencies, tax implications, risks, warranties, and other matters relating to the overall consequences of the proposal, as follows:

A. The Issue and the Problem
B. Revenues and Incentives
C. Taxes: Revenue Impact
D. Assurances
E. Residual Value
F. Risks
G. Contingency Plans

The remainder of the testimony will be organized under these seven headings.

A. THE ISSUE AND THE PROBLEM

The issue is whether the government should abandon a major research and development project relating to nuclear fission. The Project was undertaken 12 years ago and it was intended to keep the U.S. in the lead of nuclear technology. One-and-a-half billion dollars have already been spent on it and an additional several hundred million dollars of canceliation costs and secondary detriments would be incurred if it were abandoned.

A primary purpose of this research and development effort is to take breeder technology for the production of nuclear energy (in the form of heat)--proven technology from three decades of experimental operations--and adapt it to the commercial generation of electrical power. Part of the Project installation will consist of electrical generating facilities (turbines, switchyards, distribution lines, etc.) which are more or less conventional in design. The Project will, when operative, produce electricity for sale to customers.

There are two distinct aspects to the Project: the research and development aspect, which is the primary purpose of the Project, and the commercial power production aspect, which is a byproduct of the research and development effort. The by-production of power will generate revenues that will cause a part of the total Project to "pay for itself."

Under the Plan, approximately $1 billion will "pay for itself." That much will be paid "up front" by private investors. Under previous arrangements, a part of the Project would, in effect, have been "paid for" gradually by revenues (less expenses) generated over the life of the plant. The estimated revenues generated under the old arrangements would have been sufficient to pay for approximately $400 million of the government's investment over a

30-year period. The greater payoff under the Plan comes about because of higher prices for output and greater operating efficiencies.

Research and development.

Under the Plan, the government would continue to fund the research and development effort and would appropriate now the government funds to be disbursed over the next seven years. Immediate appropriation is required so that the parties concerned can proceed in confidence that the Project will be completed and can provide, through private borrowing, supplemental funds adequate to permit optimum construction scheduling.

The electric utility industry and project contractors have committed to contribute $325 million (including interest) to the research and development effort, in the belief that the technology will ultimately benefit electric consumers (as distinguished from stockholders). One hundred fifty million dollars of that amount have been contributed and the remaining $175 million will be contributed only if certain conditions contained in those commitments are satisfied. (If the government abandons its further funding, the utilities will do likewise.)

The utility group of R&D contributors neither has nor expects to have any ownership interest in the Project, or in any of its revenues.

The payoff for the research and development effort must come in the form of advanced technology, which will benefit both the nation as a whole and future consumers of electricity in particular.

Power generation

Under the Plan, the power generation aspect of the Project incidental to the research and development aspect would, in effect, be sold in the open marketplace to private investors (not to utilities, nor to the utility group).

The price at which any productive facility can be sold in the open marketplace depends entirely upon the amount of revenues the facility can be expected to generate and upon the amount of the expenses, including taxes, which must be funded out of those revenues. The principal work of the Task Force was to bring together the electric industry, the investment banking community, and the financial, tax, and legal expertise required to examine the potential revenues and expenses and to determine how the sale of the power generation aspect could best be structured to bring the maximum price in the open marketplace.

The Plan concludes that the power generation aspect can be sold for approximately $1 billion if the transaction is structured as recommended. That represents about 40% of the Project's remaining cost. What would be sold is the productive capacity, its revenues and attendant expenses. If the revenues are sold, they will not, of course, accrue to the government, except for possible excess earnings after the bonds have been paid off.

The sale price

The sale price obtainable for the power generation aspect depends, obviously, upon what is being sold. The more being sold and the fewer the risks to the purchasers, the greater the price obtainable.

As the Plan assumes the sale in the open marketplace, one can assume that it will be a "fair" price.*

The package proposed to be sold is, in the judgment of the Task Force, the optimum package to command the best price in order to achieve the maximum reduction in the amount of Federal funding required to complete the project.

Public v. private ownership

In assessing the Plan, the real issue to be addressed is whether it is preferable for the government to sell the productive capacity aspect to private investors or to keep it for the government. That will depend in part on the price obtainable from private investors for the power generation aspect and in part on the value of the productive capacity if kept by the government, a matter which is discussed in Section B below.

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* It is, of course, true that a fair price may, in retrospect, appear to have been disadvantageous to one party or the other, depending on how original uncertainties subsequently turn out. But since neither party knows in advance how the uncertainties will be resolved, the open marketplace remains the final arbiter for fair market values.

B. REVENUES AND INCENTIVES

The power output of the Project will be worth more if marketed by the private sector as provided in the Plan than if marketed by the government under the existing arrangement, because the revenue stream will be larger.

This is true for two reasons:

(i) Higher electricity price if owned by the private sector

A key part of the Plan is to recommend a basic change in the way the power output is marketed. This recommendation is based upon the judgment of Task Force members that the power can be sold, and more profitably, under alternative arrangements. The change recommended could be made alone, without other elements of the Plan, albeit with difficulty, but the aspects of the Plan dealing with private participation make the change easy and natural.

Under current arrangements the government would retain the power generation aspect and the power would be sold to the TVA for use on its system at prices at or below what it would cost the TVA to produce such power (the TVA's "avoided cost"). In that event, the price of power in 1996 (five years after startup) would be in the range of 7¢ to 8-1/2¢ per kwh, or possibly lower.*

Under the Plan, the power would be sold to private utilities at a price at or near what the utilities would otherwise have to pay for such power, viz., _their_ "avoided cost." Because of differences in the character of the systems, the avoided costs of private utilities in the Southeast are generally higher than those of the TVA. Thus, under the Plan, the power will be sold to systems where it has the highest replacement value, rather than to the TVA, which has among the lowest costs. The predicted price for power sold to such private utilities in 1996 is 11¢ per kwh.**

The gross revenues generated will accordingly be substantially greater under the Plan. These greater revenues will be obtained without increasing charges to any electric customers because, under the Plan, Clinch River power will never be sold for more than what the power it replaces would have cost. However, if sold privately, the Clinch River power will generally displace power generated with oil while, if marketed in the TVA area, it will displace power generated with coal.

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* Based upon predictions of TVA's avoided energy cost made by the S. M. Stoller Corporation for Project Management Corporation, March 18, 1983, Table 2-1. These predictions are based on TVA input (see p. 2-3).

** Based upon the Stoller report, _id_. See Subsection (c), below.

In either case, it is estimated by the BRC Task Force that the Project's fuel, other operation and maintenance expenses will approximate 5-1/2¢ per kwh in the mid-1990s and that the Project will, on average, produce about two billion kwh per year (65% capacity factor). Thus, under the old plan, there would be no more than 1-1/2¢ to 3¢ per kwh available to the government to cover its debt service, and possibly less on an annual basis, round-the-clock. The net annual revenues available for debt service under the old plan would be expected to approximate $40 million to $50 million (two billion kwh at 2¢ or 2-1/2¢ per kwh, the middle of the above range).

By contrast, the Plan is expected to provide net revenues of at least 5-1/2¢ per kwh in the mid-1990s and thereafter, on an annual basis round-the-clock, equivalent to $110 million a year available for debt service on private debt.

(a) Why sale to the TVA?

Under current arrangements, the Tennessee Valley Authority has first claim on Clinch River power. Whether or not the preference clause would apply directly to that power, its long-standing application to power sales from most Federal projects makes it highly unlikely that the TVA (or DOE, if it were to retain sole ownership and financing responsibility) would be willing or able to distribute that power to private utilities outside TVA's service area over the objections of municipal customers. Nor does it seem likely that the Congress would look kindly on such an action. Moreover, it is not clear that the TVA could legally pay more than its avoided cost for Clinch River power, if for some reason it were inclined to do so--a question which could probably be settled only by litigation.

(b) Will there be a need for Clinch River power?

Much has been said of the possible lack of need for Project power, based in part on testimony of William Willis of the TVA.* But we do not anticipate the sale of Project power to the TVA. So long as oil is being used to generate electricity in the southeast region of the U.S., there should be an adequate market for Project power. After all, the Project represents far less than 1% of the installed capability of the Southeastern Electric Reliability Council ("SERC") region.

(c) How sure is the 11¢ per kwh estimate?

As stated earlier, the 11¢ per kwh revenue estimate was derived from estimated avoided cost data provided in a report prepared by The S. M. Stoller Corporation (SMS) and submitted to Project Management Corporation on March 18, 1983.

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* 129 Cong. Rec. S. 11185 (daily ed. July 29, 1983).

For 1991, immediately after scheduled completion of the CRBR Project, four major utility systems surveyed by SMS reported estimates of avoided energy costs averaging 11.7¢ per kwh. By 1996, the overall average for all utilities surveyed outside the TVA system had grown to well over 11¢ per kwh.*

The SMS projections were arrived at after comprehensive surveys of investor-owned utilities surrounding the TVA area.

In making the Task Force projections of future CRBR revenues, we have used a flat figure of 11¢ per kwh, thus ignoring all inflation after 1996.

Therefore, we believe our 11¢ per kwh revenue assumption is attainable and conservatively low.

(ii) Greater output and more efficient operation if owned in the private sector

Our June 29 report makes clear that the Plan, coupled with a one-time multi-year appropriation, will minimize construction costs by insuring against delays from lack of funding and enabling flexible draw-down of private funds so as to permit optimum construction scheduling.

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* The predicted average avoided cost in 1996 for all non-TVA utilities surveyed by S.M. Stoller Corporation is 13.4¢ per kwh (peak) and 10.7¢ per kwh (annual average), for a conservative estimate of 11¢ per kwh, net of wheeling charges, assuming a modest capability to favor peak period operation of the Project's generating capacity.

It also points out that once the Project has been placed in service, the financing obligations contemplated by the Plan will provide strong incentives to operate the Project in such a way that the debt service and other financial requirements will be met consistently. The Project will be managed solely by the government and its managers will have compelling reasons to operate the Project in the most efficient manner possible. Because they will have specific financial targets, they will seek to avoid jeopardizing net revenues and, thus, being put on the spot for triggering the DOE's obligations to private investors--obligations which induced the investors to back the Project in the first place. All this will enhance the possibility of providing significant residual values for the Treasury.

The foregoing incentives (coupled with a multi-year appropriation) are of major significance. Without them, there will be constant temptation for the Government to change course -- to delay appropriations, defer completion, vary construction and operating plans, interrupt output, and generally adopt practices which would increase costs and reduce net revenues. With such incentives, the Project can be operated in a manner which will maximize the amount of private financing and at the same time preserve its R&D character.

It is clear that the foregoing incentives which are inherent in the Plan will, when coupled with a one-time, multi-year appropriation, minimize construction costs and maximize revenues. In my opinion, based upon nearly 40 years of management experience at Commonwealth Edison Company, these factors will significantly reduce construction costs and enhance future output and revenues.

Higher construction costs.

My estimate of an increase in construction costs, without the multi-year appropriation and the efficiency incentives, is based upon my belief that in their absence it would be almost impossible to complete the Project on schedule. Every year would see a new attempt to delay or reduce appropriations and defer construction. There has already been an eight-year delay, due primarily to government actions or inactions. These delays have cost the government dearly in adding to the cost of the Project.

Reduced revenues.

Under the existing arrangements, without the system of incentives inherent in the Plan, the power output of the Project would be unlikely to exceed 1.6 billion kwh per year for the following reasons:

(1) If the Project were not financed in large part through bonds, which can only be repaid by Project revenues if there is a serious attempt to maximize commercial output, there would be a strong temptation to change

course frequently, to alter fuel cycles, to cater to pet projects of this or that faction in the government, and to become lax in the day-to-day operation of the facility. This would almost be inevitable if there were no direct obligation to produce power and maximize revenues.

(2) If the power were sold to the TVA at prices only moderately greater than the out-of-pocket cost of producing that power, those at Clinch River would know it and could be tempted to downplay the urgency of achieving increased output because of the relatively small resulting increment of net income.

As a result, the estimated annual revenues available for debt service could (under full Federal funding) amount to only $35 million, as a rough average, compared with $110 million under the Plan--a reduction of $75 million a year.

C. TAXES: REVENUE IMPACT

Income from assets owned in the private sector is subject to Federal income tax. In computing that tax, gross income is reduced by the deduction of costs (so that only the net income is taxed), and the tax is further reduced by the investment tax credit (ITC). Under present law, the timing (as distinguished from the amount) of the deductions for depreciation together with the investment tax credit provide offsets or "benefits" that significantly reduce the real burden of the income tax below the rates formally prescribed in the Internal Revenue Code.

Moving a portion of the Project from the public sector to the private sector, as the Plan proposes, makes income from that portion of the assets taxable, and at the same time, eligible for "tax benefits" that reduce taxes. It thus raises the question of whether the combination of taxes and tax benefits somehow "costs" the Government more than if the assets were continued to be owned in the Government sector.

The short answer is no. The answer would be different if other than conventional tax "benefits" were involved. But that is not the case here, as only standard benefits, of the kind generally available to all private investors, are contemplated.

Attached as an Exhibit to this testimony is recent correspondence between the Department of Energy and the Treasury Department.* The Treasury response dated September 14, 1983 indicates that, assuming that greater power sales revenues will be available to the

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* Letter dated September 2, 1983 from Hon. Shelby T. Brewer, Assistant Secretary for Nuclear Energy, Department of Energy to Hon. John E. Chapoton, Assistant Secretary for Tax Policy, Department of the Treasury; Letter dated September 14, 1983 from Hon. John E. Chapoton to Hon. Shelby T. Brewer. Both letters are reproduced in Exhibit 1.

Project under the Plan than under present arrangements, there will be a net revenue gain to the Treasury.

Nevertheless, questions have been raised concerning the appropriateness of allowing the equity participants in the Clinch River Project the same conventional tax credits and deductions which this Congress has generally provided to equity owners in virtually all other privately financed projects.

We have assumed that these conventional benefits, related to the privately financed portion of the Clinch River Project, will be available to the equity participants in accordance with existing law.

However, if the Congress chooses to penalize this Project as compared with other large projects, and withhold these tax benefits, this will not be fatal to our plan. We could finance by issuing additional revenue bonds and little or no equity, but this would reduce the likelihood that the debt would be paid off early, and would thus postpone the time when the government is relieved of its contingent assurance obligations.

As there appears to have been some misunderstanding of the role of taxes, a more detailed discussion of the tax aspects is set forth in the Appendix. That discussion points out, inter alia, that the advantages of the Plan do not, in fact, depend upon any particular set of tax consequences. It is important only that prospective investors know what tax consequences to count on.

D. ASSURANCES

The assurances required are set forth in the appendix to the June 29, 1983 report of the BRC Task Force. They are also described in Mr. Potter's testimony before this Committee.

If the project consisted solely of a conventional generating facility, unrelated to a research and development effort, it is probable that financing the electric power production aspects of the project would require no government assurances beyond those customarily extended by any operator, viz., that the facility was built to specification and would operate as represented. In such a case, a conventional commercial facility would be expected to produce a predictable and reliable income stream.

Here, however, we do not have a conventional commercial facility. The generating capacity is subsidiary to a larger, ongoing governmental research and development effort on which the electrical production and cash revenue streams are dependent. Moreover, the entire Project is managed by the government and is subject to the uncertainties surrounding nearly all government projects. For example, the government might shut down the plant for an extended period for study or experimental purposes--or merely as a result of changed government policy, or of differences between the executive and legislative branches. Given these circumstances, therefore, the electric production aspects of the project will not be saleable without assurances that the actual revenue stream will be uninterrupted and sufficient to cover the debt service.

The fact that the government is in complete command and is expected to manage the Project as a massive research and development effort will inevitably create great uncertainty in the minds of private investors. That uncertainty is within the control of only the government, but it can be removed by government assurances. Uncertainty exacts an economic cost and the elimination of unnecessary uncertainties is generally in the best interests of all parties to a transaction. If the revenue assurances are conservatively set (as we have recommended), they should cost the government nothing. On the other hand, they will help a great deal in attracting private capital on favorable terms.

The only additional assurances to the equity owners are that the expected tax consequences will remain available. Here again, the government can eliminate uncertainty and attract more private capital at no cost to itself. If any of the expected tax consequences are eliminated, in most circumstances the government will be obligated to make restitution. However, that obligation will be offset by increased taxes paid to the U.S. Treasury.*

No effect on licensing and regulatory activities

The Plan does not affect the Nuclear Regulatory Commission ("NRC") licensing process in any way. The Project is not seeking a Congressional waiver of licensing requirements. The Project will have the same NRC review under the new Plan as under the current plan. The same should be true for all other regulatory requirements, and the record should indicate that this is the case.

Why then is an assurance as to licensability needed?

The assurance as to licensability is required to insure that the government managers who have overall construction responsibility will do their job. The private investors are looking to a future revenue stream for their security. But if there is no operating license, there can be no revenue stream. Nor, for that matter, can there be any future R&D benefits.

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* The assurances required are less than those a lessee of equipment generally gives to the owner of the equipment to assure the owner that the rate of return on its investment will not be reduced by unexpected tax consequences.

There is no intent to bypass licensing requirements. The assurance does not guarantee licensing -- it just insures against no license. Of course, the money will not start flowing and the government will have no obligations under the financing plan unless and until a construction permit has been issued.

E. RESIDUAL VALUE

The Project is expected to have significant residual value beyond that assumed in the illustrative example:

- If more than two billion kwh per year of power can be produced and sold;
- If this power can be sold for more than 11¢ per kwh, as the passage of time and continuing inflation result in higher avoided costs;
- If the generating facilities continue to operate after the revenue bonds have been retired, which may result either from early retirement of debt or extended operating life of the facility.

The realization of these residuals may be delayed somewhat because it is expected that a significant portion of any "excess" revenues remaining after all operating expenses and scheduled debt service obligations have been met will be used, in the first instance, for the early retirement of debt and the resulting reduction or extinguishment of the government's contingent liabilities.

Thereafter, it is expected that the residual value will be shared by the government and the equity investors according to whatever formula appears to be most appropriate for the Project, as determined in advance by negotiations with the Secretary of Energy. It would seem reasonable to provide for a government-private sharing of residual values, roughly in proportion to the respective investments, 75% - 25%, if this meets tax requirements.

The value of the residuals is so difficult to estimate that they will not be the subject of a separate payment by the equity owners, but rather, would be considered by them as one of the elements in determining whether to invest, and on what terms.

In any event, no guarantees or assurances of any kind would be provided by the government with respect to the availability of residual values, and any money paid therefor by equity investors would be fully at risk. To the extent that residual values are used to cover unanticipated expenses, the equity holders will share in such costs.

F. RISKS

It has been alleged:

- That the government's risk is increased rather than reduced by the Plan,* and
- That private investors are assuming little or no risk thereunder.

My response is set forth below.

(i) The government's risk is not increased under the proposed financing plan.

It has been said that "the plan increases the federal government's risk exposure and is almost certain to increase the project's cost."** This is wrong.

Reduced project cost.

The total cost of completing the Project will be substantially less under the Plan, for reasons already discussed, than if paid for 100% with Federal funds appropriated annually in accordance with past practice, even assuming an uninterrupted construction program.

In addition, the net revenues available for debt service will be 2-1/2 to 3 times greater under the Plan because the management incentives previously discussed will cause more power to be produced and that power will be sold at a higher price -- all of which will increase such net revenues by an estimated $75 million a year. (See Section B above.)

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* 129 Cong. Rec. S. 11187 (daily ed. July 29, 1983)

** Id.

The private borrowings (both interim and long-term) will cost somewhat more than direct Treasury borrowings, but not the "one to nine percentage points more" referred to in the above-referenced article. The difference between debt service costs of long-term government debt and private debt supported by government assurances is expected to approximate one percentage point, or less than $10 million per year -- a figure far outweighed by the anticipated $75 million of greater annual revenues available to cover such debt service cost. For short-term construction borrowings, the added annual cost of private debt would be far less than one percentage point per year.

No increased risk.

In order to obtain the maximum market value for these revenues, and thus provide the maximum reduction in appropriations, a number of government assurances will be required, but these do not increase the government's net risk -- they merely substitute a contingent liability for a direct appropriation of the full completion cost.

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(ii) Significant risks assumed by private equity investors

The risks to be assumed by investors in long-term revenue bonds are minimal for reasons described by Mr.

Potter. However, as stated earlier, uncertainty exacts an economic cost and the elimination of unnecessary uncertainties is generally in the best interests of all parties.

The risks to be assumed by the equity investor are substantial, as follows:

- The period required to realize fully the tax depreciation associated with an equity participation in the Project is unusually long -- perhaps as long as 20 years. This interval introduces a special risk, namely, that the equity investor may not be able to use the expected tax deductions and credits when they become available because he may then have no taxable income. Who could have predicted, 15 or 20 years ago, that Chrysler or Ford or Lockheed or the steel companies would have experienced such a drastic deterioration of their financial condition as has occurred since then?
- Due to the long construction period and the uncertainties surrounding such questions as when depreciation deductions will commence, the equity investor may face significant risks of delay in realizing tax benefits -- even

though the ultimate realization of those benefits is assured.

- The unique character of the Project may result in uncertainties as to what tax consequences are "assured," even after a preliminary tax ruling has been obtained.
- If inflation resumes and interest rates rise sharply, the present value of future tax deductions and residual values will be reduced. In that event, the equity investor will suffer significant opportunity loss, i.e., the opportunity to invest in another project with more predictable results.
- If the project is prematurely terminated, a "recapture" of tax benefits may occur. While the equity owner would expect to be compensated for such recapture, he can suffer considerable loss if the amount of compensation falls short of the investment return he expected when he made his investment. (Note that the recaptured tax revenues would be available to the government to cover the cost of such compensation.)
- Any return anticipated by equity owners as a part of the residual value of the Project will always be fully "at risk."

G. CONTINGENCY PLANS

Any large construction project of this magnitude involves contingencies or uncertainties. The possible consequences of some of these contingencies, such as construction delays and cost overruns, are negative. Other possibilities, such as increases in future revenues due to inflation, can be positive.

Since there is no way to eliminate all uncertainties, we have specified certain government assurances in order to provide saleable investment instruments. On the other hand, we contemplate that any "excess" revenues will be used in the first instance primarily for the early retirement of debt so as to reduce or eliminate the need for such assurances as soon as possible.

In addition, we recommend that, after the Project has been placed in commercial operation, an attempt be made (if the government wishes) to sell stock and use the proceeds to purchase some or all of the facility from the government.

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A few observations on our contingency planning are set forth below:

(i) Potential schedule delays and cost overruns

There is no way to eliminate these risks entirely, but we believe they will be substantially reduced by the Plan for reasons already indicated, namely:

- The multi-year one-time appropriation coupled with a flexible pool of available construction borrowing will enable an optimum construction schedule to be adopted and followed. This has not been previously possible.
- The incentives provided by the Plan will help ensure that the construction team will be well-organized and eager to do their very best.
- The advanced state of engineering and design work coupled with the fact that most of the components are on hand or on order lends considerable credibility to the present schedule and cost estimates.
- Stone and Webster, Westinghouse and Burns and Roe have written letters expressing their conviction that the construction schedule and cost estimates which the Plan relied upon are reasonable and attainable. Based on my own experience at Commonwealth Edison, in connection with our 13 million kilowatt nuclear construction program, I agree.

It should be recognized that if construction cost overruns are caused by higher than anticipated inflation, such inflation would normally be expected to increase the avoided cost of generation to the purchasers of such power and thus the price they would pay for Project power. The resulting increases in revenues from power sales over thirty years of operation, running from 1990 to 2020, should ordinarily outweigh the corresponding effect of inflation on construction costs between now and 1990.

(ii) Higher interest costs

Interest rates are generally a function of inflation rates. If interest rates go to 12% and stay there, the annual debt service requirement may increase from $110 million to $140 million. At the same time, however, an extended period of higher interest rates is almost sure to be accompanied by higher inflation. In that case, the net revenues available for debt service would also be expected to increase to about $140 million annually, assuming that the higher inflation would increase the net value of power sales from 5-1/2¢ to 7¢ per kwh by the mid-1990s.* Moreover, continuing inflation over the life of the Project may well provide further revenue increases far beyond the level needed to cover initially-established debt service requirements.

(iii) Reduced power output

We have tried to be conservative in our estimates of the Project's net generating capability.

We have assumed a capacity factor of only 65% even though the project's output will almost never be restricted by economic dispatch or system considerations. Thus, the 65%

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* These figures assume that 12% interest rates would be accompanied by 9% or 10% annual inflation rates, which are higher than those used in arriving at the earlier estimates of future net revenues.

capacity output assumption is tantamount to an assumption of 65% equivalent availability. Many nuclear units have availability records far better than that. The CRBR facility was designed to operate at an equivalent availability of 82%.

We believe the Project will, on average, turn out more than two billion kwh annually, year-in and year-out.

(iv) Reduced need for power

A good deal has been said by the opposition as to there being no need for power in the Southeast region.

To quote from the Congressional Record of July 29, 1983, at S. 11187,

> The plan's authors are rather vague about who will buy Clinch River's electricity. Several utilities have allowed that they might buy some electricity from the plant at avoidance costs,... but no utility has yet been willing to sign binding contracts for purchase of the electricity even under these favorable conditions, much less at fixed market rates. The reason for such reluctance was best explained recently by TVA's general manager, William Willis. As he explained in testimony before the Environment and Public Works Subcommittee on Regional and Community Development in April, "...we do not anticipate having any need for capacity in that time frame" (through the year 2000). [emphasis supplied]

My response to this is as follows:

(a) The TVA's capacity situation is better than that of many utilities in the Southeastern Reliability Council (SERC) region, and the

TVA uses very little oil to generate electricity.

(b) The Plan does not contemplate selling power to the TVA because, as stated earlier, a higher price can be obtained from private utilities in the Southeast.

(c) In May, 1983 the SERC wrote to the Project stating that "there is indeed a more than sufficient market for firm power (capacity and energy) in the amounts designed for the Clinch River Breeder Reactor for the years 1992 and subsequently."

(d) The Project will add less than 1% to the capacity of the region, which could be absorbed by almost negligible load growth.

(e) The power revenues projected in the Plan (11¢ per kwh by 1996) do not include any allowance for capacity credits. If additional capacity is needed in the Southeast and can be provided by the Project, then our estimates will be too conservative.

(f) Finally, so long as utilities in the SERC region are burning oil to make electricity, any additional nuclear generation will be a welcome addition from the viewpoint of both economics and national security.

* * * *

The members of the BRC Task Force, which I represent, are uniformly enthusiastic about proceeding with the Clinch River Project on the basis we have described. We believe it to be financially viable, a useful, important cooperative endeavor between government and industry, and a major contribution to the most promising of the energy technologies which will be needed to eliminate increased reliance on fossil fuels. It has the full backing of the Administration and DOE.

We are looking forward to working with the DOE and the Congress on this Project and we particularly appreciate your having invited us here to testify.

APPENDIX: TAX ASPECTS

All production revenues flowing to private investors will be fully taxable. The Plan contemplates that the private owners of the productive capacity will compute their tax liabilities in exactly the same fashion as other private owners of plant and equipment. Owners of private plants deduct from revenues all of the expenses related thereto, and they depreciate the cost of the plant, as only the difference between revenues and costs is net income subject to tax. Under present law, the time (but not the aggregate amount) of the depreciation deduction is governed by the Accelerated Cost Recovery System (ACRS) enacted by Congress in 1981. Owners of private plants are also eligible for an investment tax credit (ITC) equal to 10 percent of their "qualified" investment. Thus, the private investors under the Plan would have only conventional ACRS depreciation and ITC. No special or unusual tax attributes are involved.

As in any private project, all of the revenues (including those required to cover debt service) will be included in the taxable income of the equity owners, and all of the depreciation deductions and the ITC related to the private investment will be likewise accounted for in the equity owners' tax returns. As in the case of any private project which is debt-financed, interest paid to creditors is deducted from the equity owners' income and included in creditors' income. While the law thus effects a rechanneling of part of the income stream from equity owners to creditors, it does not require or permit a similar rechanneling of deductions and credits. That tax rule makes tax administration easier and does not affect Treasury revenues (because the aggregate amount of income, deductions and credits in the system remains the same). However, in the early years, before and after an asset is placed in service, it causes the net income reported by equity owners to be less than the amount of their deductions and credits. That result flows from the statutory design of the ACRS depreciation deductions and the ITC, the value of which is distributed at the "front end" of an asset's life. It is more visible in the case of taxpayers with a single asset than in the case of taxpayers with a mixture of many assets, as the net income from other assets in the mixture absorbs the net deductions and credits generated by new assets. But the underlying economic flows are the same in all cases.

Whether or not this is a good or bad tax policy is not a question to be decided in the context of any single project. It is a system consciously adopted, refined and expanded by the Congress over more than two decades and designed to encourage new investments and new jobs. Whatever one's policy views, under the present tax structure the tax consequences outlined above are the normal result.

The central point to bear in mind in weighing the Plan is that the Government saving that would result from implementing the Plan has nothing to do with the tax treatment of investors. Private participation under the Plan will result in higher electric revenues to the Project (at no additional cost to electric customers) and more efficient plant operation, whether or not the private participants are fully taxable on the project revenue they receive. While the Plan description assumes the normal availability of tax liabilities and "tax benefits," the Plan does not, in fact, depend upon any particular set of tax consequences. It is important only that the tax consequences be reasonably certain.

There are a variety of tax details that will ultimately have to be settled, one way or the other, such as the status of deductions for interest paid during construction and the appropriate recovery period to be used for depreciation purposes. They will affect the precise amount for which the equity interests can be sold in the marketplace, but will not affect any of the general conclusions reached in the Task Force report. Those detailed questions cannot be resolved in advance of final arrangements for a specific transaction, and the Plan contemplates that the final transaction format will simply accommodate whatever determinations are made with respect to those details. No special handling of such items is desired or expected.

Department of Energy
Washington, D.C. 20585

September 2, 1983

Honorable John E. Chapoton
Assistant Secretary for Tax Policy
Department of the Treasury
15th Street and Pennsylvania Avenue, NW.
Washington, D. C. 20220

Dear Mr. Chapoton:

I am writing to request the Treasury Department's analysis of the tax revenue impact, if any, of a proposed plan as outlined below.

A Task Force of private utility and financial experts has been engaged in developing a plan for private funding of a part of the cost of completing the Clinch River Breeder Reactor Project. A copy of the Task Force's report describing the Plan is enclosed.

The Plan is based upon the fact that the Project is basically a research and development project, but that a by-product of the research and development will be the generation of electricity to be sold to private consumers.

The broad design of the Plan is, in effect, to sell the production aspect of the project to private investors in the open marketplace, while retaining the research and development aspect for the Government. Technically, as the project cannot be physically segregated into components that relate solely to research and development and components that relate solely to by-production of electricity, the Plan would be implemented by joint venture between the Government and private investors.

The total cost of the project, if completed, is estimated at approximately $4 billion, of which approximately $1.5 billion has been committed to date and $2.5 billion remains to be funded. The Task Force Plan outlines, in concept, what is to be sold to private investors and the Task Force financial experts estimate that the recommended sale package will bring a price of approximately $1 billion. The Task Force experts believe that adoption of the Plan will result in the electricity generated being sold at higher prices than it would have been sold at under existing arrangements.

[redacted]

Exhibit 1

If carried to completion, the by-production of electricity will pay for a part of the total cost to the Government and the net cost of the research and development project would then be the total project cost, less the portion that "pays for itself." The Task Force believes that its Plan will permit a much larger portion of the project to "pay for itself" than would be the case under existing arrangements. That difference comes entirely from the fact that the electricity revenues would be larger under the proposed Plan than under existing arrangements. Under existing arrangements, sales of electricity over 30 years are estimated to be such that approximately $400 million of the $2.5 billion completion cost would "pay for itself," which means that the net remaining cost of the research and development component would be $2.1 billion over 7 years, or an average of $300 million a year. Under the proposed Plan, on the other hand, an estimated $1 billion will "pay for itself," by selling the generating capacity in advance to private investors. The net cost for the research and development component would thus be reduced from $2.1 billion to $1.5 billion over 7 years, an average of $210 million a year.

The saving, as noted, comes solely from the difference in the projected revenues from electricity sales. The revenues would be guaranteed by the Government to the extent required to cover the debt portion of the private investment, but the Task Force is comfortable that the revenues will, in fact, be ample to cover the debt (so that the Government will never be required to advance any funds, except temporarily) unless the Government fails to complete the project or its research and development activities are operated in a way that disrupts production.

In effect, the Plan would "privatize" the electric generating aspect of the project and contemplates that the private owners of that part of the project would be treated as other private owners of plant and equipment are treated, including for tax purposes. Private investors in privately owned plant and equipment assets are taxed on the income from their assets, but it is my understanding that in computing the net income which is taxable, they are entitled to exclude the cost of the assets (depreciation) and are entitled to an investment tax credit (ITC). The ITC is often characterized as a "tax benefit", as is the fact that under the Accelerated Capital Recovery System (ACRS) depreciation system enacted in 1981, depreciation deductions may be taken earlier than they economically occur (the "benefit" residing in the "earliness," not in the amount of the deduction).

The Plan assumes that the joint venture will be so structured that the portion of the total project which is owned by private investors will be governed by the same tax provisions that govern any other comparable asset which is privately owned (i.e. that ACRS and the ITC will be available). Some confusion has arisen as to whether, because of the "tax benefits" which accrue to private owners, there is some revenue loss to the Government from having such an asset owned privately, rather than by the Government. If so, that loss would be relevant in determining the "saving" to the Government under the Task Force Plan, because the saving described, which comes from higher electric sale prices, would have to be reduced by the cost to the Government of shifting ownership from the public sector to the private sector. (I cannot refrain from expressing some personal dismay at the thought that it might somehow "cost the Government more" when plants producing consumer goods are owned privately, rather than by the Government. If so, that would seem to argue that everything should be owned by the Government.)

The concern about a possible revenue loss arising from having plants owned privately, rather than by the Government, has been heightened by the pending consideration of H.R. 3110, which we understand the Treasury has supported, at least in part. That bill would deny tax deductions and credits normally available to private owners in the case of privately owned assets when the output is used by the Federal Government. The present case involves a different situation, namely, a privately owned asset whose output goes to private consumers, rather than to the Government's own use. Nonetheless, it would be relevant to know whether the reasons the Treasury has supported H.R. 3110 are in any way applicable to the present Plan.

The Administration has endorsed the Task Force Plan, its conclusions and the assumptions on which it is based. In order that we may correctly analyze the tax concerns that have been voiced, we should very much appreciate the Treasury's views on the following technical questions:

1. In respect of the tax policy considerations involved in H.R. 3110, is there a difference between cases (a) where the Government uses the output of the property and (b) where, as here, the output is sold into the private market?

2. Assuming operating costs are equal and electric output and prices the same, is there any net loss to the Government from moving ownership of a part of the project from the Government sector into the private sector, as described?

3. Assuming operating costs are equal but that the private owners would, as described, invest an amount which reflects the expectation that they can sell the output for more than could the Government, is there any gain or loss to the Government?

Sincerely,

Shelby T. Brewer
Assistant Secretary
for Nuclear Energy

Enclosure

DEPARTMENT OF THE TREASURY
WASHINGTON, D.C. 20220

ASSISTANT SECRETARY

SEP 14 1983

Dear Mr. Brewer:

Thank you for your letter asking the Treasury Department's analysis of the revenue impact of the Clinch River Breeder Reactor Project. Your letter presents three technical questions, which I will answer directly.

(1) Q. In respect to the tax policy considerations involved in H.R. 3110, is there a difference between cases (a) where the government uses the output of the property and (b) where, as here, the output is sold into the private market?

A. Yes, because H.R. 3110, the Pickle Bill, deals with assets used by governments, and the use of services by governments. By contrast, the power generating assets of the Project would be used for private purposes. If the Pickle Bill were applied to this kind of situation, consumers would either have to pay higher than market price (which is unlikely) or the private investors would not invest as much and the government would have to stand the difference.

(2) Q. Assuming operating costs are equal and electric output and prices the same, is there any net loss to the government from moving ownership of a part of the Project from the government sector into the private sector, as described?

A. No, although there may be some change in the timing of costs borne by the public and private sectors.

(3) Q. Assuming operating costs are equal but that the private owners would, as described, invest an amount which reflects the expectation that they sell the output for more than could the government, is there any gain or loss to the government?

A. There would be a gain to the government. Consumers would be covering costs in the price which the government would otherwise have to cover in expenditures.

Please understand that Treasury makes no judgment about which of the hypothetical cases in questions (2) and (3) is likely to prevail, nor do we draw any conclusions about the desirability of the project from the point of view of private investors. We do not, however, foresee any offsetting losses to the government resulting from private rather than public financing.

Sincerely,

John E. Chapoton
Assistant Secretary
(Tax Policy)

The Honorable
Shelby T. Brewer
Assistant Secretary for
Nuclear Energy
Department of Energy
Washington, D.C. 20585

COMMENTS ON THE REPORT OF THE CONGRESSIONAL BUDGET OFFICE (CBO) CONCERNING THE PRIVATE FINANCING PLAN FOR THE CLINCH RIVER BREEDER REACTOR PROJECT

* * * * * * * * * * *

Submitted by Gordon R. Corey,
Chairman of the BRC Task Force, to
the Senate Committee on Energy
and Natural Resources

The CBO report accepts the BRC Task Force's central proposition that maximizing the future revenue stream from sales of power output will greatly reduce the cost of the Clinch River Project to the government.

The CBO also asserts that financing costs would be reduced by substituting additional government financing for private financing. This is the sole source of the savings attributed to government financing, shown in Table 3 of their report.

We disagree, analytically, with that proposition. When all effects are considered, the government does not save money by substituting Treasury borrowings for private borrowings even though the Treasury rate is less than the private borrowing rate. Treasury agrees with us on this point.

More important, however, is the fact that the enhanced revenue stream made possible under our private financing plan would be jeopardized under full government funding.

If the revenue stream is reduced, as we believe it would be under the CBO's government financing plan, then there will be large losses (instead of gains) to the government, as shown in the attached table.

This table makes no attempt to correct the CBO computations for assumed interest savings which are illusory.

Gordon R. Corey
September 26, 1983

Congressional Budget Office's Table 3
Cost to the Government Adjusted to Reflect
Assumptions Embodied in the BRC Plan
(present value in millions)

	Government Financing Plan	Private Financing Plan	Private Plan Advantages (b)
CBO Base Case	$1,105	$1,353	$248
Adjusted Base Case (a)	1,749	1,353	396
Difference	644	-0-	644
Explanation (c): -			
(1) Effect of lower prices for power sold under the government plan	564		
(2) Effect of lesser power output under the government plan	80		
	$ 644		

NOTE: All figures shown are approximate.

(a) Reflects sale of power to the TVA under the government-financed plan and lower power output thereunder, (1.6 billion kwh per year), as provided for in testimony by Gordon R. Corey before the Senate Committee on Energy and Natural Resources, September 22, 1983.

(b) A positive difference indicates that the government financing plan costs more than the private financing plan; a negative (circled) difference indicates that the private plan costs more.

(c) For a detailed explanation, see attached sheets.

DETAILED EXPLANATION OF TABLE 3 ADJUSTMENTS

1. Higher prices for Clinch River power under the private financing plan.

The CBO concludes that by selling Clinch River power outside the TVA region over a billion dollars of commercial value can be provided.

We agree with that.

However, this result cannot be achieved with a wave of the hand as long as the Project is wholly federally financed. Current arrangements do not provide for the sale of power outside the TVA. On the contrary, due to longstanding political considerations, it would be unlikely that wholly federally-financed and generated power could ever be sold at favorable prices outside the TVA area. Such a proposal would open Pandora's box.

To propose such action would raise broad objections on two fronts.

First, there would be allegations from the private sector that the restrictions on TVA expansion embodied in the TVA Act were being abridged.

Second, there would be outcries from municipalities and co-ops within the TVA area that their rights to federally subsidized power at the lowest possible cost were being denied.

It would be extremely difficult and time-consuming to enact such legislation. On the other hand, under the BRC Task Force plan, the desired result to sell privately-generated CRBR power to the highest bidder, wherever and whoever he may be, would be accomplished easily almost automatically.

In summary, unless specific action were taken to permit federally-generated Clinch River power to be wheeled outside the TVA area, the alternative to our plan would be to sell such power at significantly lower TVA prices for the entire life of the project, not just five years.

2. Larger power output under the private financing plan.

The implication in the CBO report that federal funding is generally better for large capital intensive projects, steel mills, oil refineries, chemical plants, because of the cheapness of federal borrowings, flies in the face of common sense, because it ignores the efficiency gains which arise under private ownership.

We on the BRC Task Force believe our plan, including multi-year funding, will provide (1) significantly lower construction costs, and (2) significantly greater power sales.

Both of these factors were ignored in the CBO analysis. We suggest that those who take the efficiency argument with a grain of salt should examine the current dismal financial record of the federal power marketing agencies.

The CHAIRMAN. We have a vote on the floor of the Senate. We will have a temporary recess subject to the call of the Chair. That will give us the opportunity to vote and return at the same time.

We'll stand in recess.

[Whereupon, a brief recess was taken.]

The CHAIRMAN. The committee will come to order.

Mr. Brewer, one of the questions that comes up in the analysis that lies with the operating efficiency or availability of the plan, there are those who criticize the plan for stating availability levels higher than that of comparable experienced light water reactors. Can you make some comment with respect to that allegation?

Secretary BREWER. Mr. Chairman, the plant capacity factor assumed in the financial calculations is 65 percent. The average light water reactor experience to date is about 61 percent. The design limit, on availability, however, for Clinch River is 95 percent compared to a design limit of about 85 percent for a typical light water reactor. That is owing to the fact that we have designed Clinch to have a shorter planned outage rate, that is a planned outage rate for refueling and plant maintenance, than the approximately 10 percent for light water reactors. So we are confident that our assumption on the plant capacity factor is quite conservative.

We have had excellent experience with FFTF and EBR-2, so, although we expect a much higher capacity factor, we assume very conservatively.

Mr. COREY. Could I add one or two points?

That is for the most recent 12-month period Commonwealth Edison's six—nuclear reactors operated in a 64.2-percent plant capacity factor and they operated with an availability factor equivalent of 78.1 percent. And in my testimony I stated that the equivalent availability would be more pertinent or relevant for Clinch River than would the plant capacity factor in determining the capacity factor because Clinch River is unlikely at any time to be limited by demand--considerations whereas that is not true of Commonwealth Edison which has an overall system capacity of about 45 percent.

The CHAIRMAN. As I recall the figures, it's been a long time since I looked at it, EBR-2, Experimental Breeder Reactor Number Two, which operated, had an on-line reliability factor better than that available on LWR's——

Secretary BREWER. Seventy-four percent over the past 12 years, Mr. Chairman.

The CHAIRMAN. And this is an experimental, not a demonstration. It's an experimental reactor and designed to test different kinds of fuel elements under different kinds of conditions and it's constantly changing in order to reflect the new experiment being run.

Another factor I think involved is that, in the shutdown for refueling, the cycle on the breeder is much different than the cycle on a light water reactor.

Secretary BREWER. Yes, sir; because of the high value of the fuel and the desire to reduce inventory charges, we designed the very shortest down time for refueling and the refueling management scheme is somewhat different.

The CHAIRMAN. Senator Bumpers.

Senator **Bumpers**. Let me ask Mr. Potter first, is Merrill Lynch willing to handle this billion dollar bond issue in 1990?

Mr. **Potter**. I don't speak for Merrill Lynch. I represent Merrill Lynch, but I can't commit Merrill Lynch.

Senator **Bumpers**. I'm not asking you to commit. I'm just asking you a very rhetorical question, a hypothetical question.

You obviously have testified here that you think this is a pretty good deal. If it were ready for letting right now, do you think Merrill Lynch would go along with it?

Mr. **Potter**. We would compete for the business.

Senator **Bumpers**. What does that mean?

Mr. **Potter**. Ours is a very competitive business, Senator Bumpers. Many other firms want it, and every time we get a piece of business we work very hard to get it. We would work very hard to get this business, I would expect, and I don't commit Merrill Lynch.

Senator **Bumpers**. Have you read Peter Bernstein's story in Fortune Magazine last year called the "Nuclear Fiasco Shakes the Bond Market"?

Mr. **Potter**. I expect that's on the Washington public power. I did.

Senator **Bumpers**. Merrill Lynch underwrote $750 million of that and made a $22.5 million fee and said at the time of the sale, "May well have been the most profitable in our history."

Mr. **Potter**. Senator Bumpers, I have the prospectus from that financing with me. The gross underwriting discount was about 15.7 million dollars, excuse me. I stand corrected. You're right. Approximately $22 million counting all three projects. The use of that money was for about 225 firms that joined us in selling the security. There were 18 managers of that issue, all of whom split the management fee.

A very large portion of the underwriting discount is paid to the firms that agree to take the risk with us and underwrite these securities.

Senator **Bumpers**. What was your risk? What was your exposure on that?

Mr. **Potter**. In this case our portion of the $750 million. If you don't sell the securities for the price that you anticipate selling them for you lose money, and we have lost money on such underwritings.

Senator **Bumpers**. You wouldn't attempt to sell an issue you didn't think was a good one would you?

Mr. **Potter**. No, sir.

Senator **Bumpers**. And you thought WPPSS was good then didn't you?

Mr. **Potter**. We disclose everything about an issue. I mean a good issue, for you a good issue might be different than for me.

Senator **Bumpers**. I'm not trying to put you on cross examination. I used to be a trial lawyer but I'm not any more. I'm just asking for information.

Obviously no brokerage house in the United States would sell a bond issue or anything else that they weren't rather comfortable with or could recommend to their clients. You're asking people to buy bonds on the strength of your recommendation, and these people bought these WPPSS bonds on the basis of Merrill Lynch's recommendations.

Mr. POTTER. The rating agencies rated these bonds AAA at the time we issued these securities. There isn't any higher rating.

Senator BUMPERS. And you made $22.5 million.

Mr. POTTER. We did not make $22.5 million.

Senator BUMPERS. This article in Fortune magazine is wrong?

Mr. POTTER. The underwriting discount is $22 million but that pays approximately 225 other firms to join us in taking the risk associated with this financing and paying salesmen to sell it.

Senator BUMPERS. What would be the fees and commissions on this billion dollar sale? And secondly, is that taken into consideration in determining what the total cost is?

Mr. POTTER. The underwriting discount for bond issue that had credit support from the Government would be substantially less than 1 percent of the principal amount, and that would be part of the reason that the financing through credit support would be higher than say Treasury bills.

Senator BUMPERS. Do you know whether or not, Mr. Secretary, maybe I should ask you that question. Are the commissions and underwriting costs associated with the sale of these bonds included in your computations here?

Secretary BREWER. I'd like to ask Mr. Corey to assist me on this answer.

Mr. COREY. Of course I will, Senator. Everything we put in here is in the nature of an illustration of what we think we can do. We put in illustrations based upon 10-percent cost of money. We ran 10-percent cost of money figures for 30-year bonds, and we ran sensitivity analysis for 11 percent and for 12 percent.

Now we're talking about underwriting fees which when translated into cost of money, are roughly one-tenth of 1 percent. The kinds of analyses made at this time about something that isn't going to be done until 1991, there's no way to compute it within a standard error of 1 percent.

We know that we're in good shape if we're in the 10- to 12-percent range. If we get very much above 12 percent or 13 or 14 percent we'll simply not be able to sell as many bonds unless of course the increase—and this is in my testimony—the increase in the interest rate is accompanied by, is a result of expanded inflation which in turn would be expected to have a comparable effect upon the avoided cost of power, because the estimated avoided costs of power in the 1990's are based upon the anticipated price of oil. And if we go to a 12-percent and 13-percent or 14-percent interest rate, I would expect that would be accompanied by increases in the price of oil, comparable increases in the price of——

Senator BUMPERS. Why do you see a direct correlation between interest rates and cost of oil?

Mr. COREY. Because cost of oil is one of the most important components of inflation and inflation is one of the most important drivers of interest rates.

Senator BUMPERS. Did you see what Secretary Regan said the other day when he was lambasting the banks about interest rates, why they weren't corresponding with the inflation rate?

Mr. COREY. No.

Senator **Bumpers**. Ah, you saw that Mr. Corey. Come on now.

Mr. **Corey**. I've been so busy going around the country on airplanes and missing them——

Senator **Bumpers**. Well, you're missing some of the greatest fun going on in this country right now.

Mr. **Corey**. I will agree.

Senator **Bumpers**. Marty Feldstein comes out and says deficits do in fact affect interest rates and Regan says it has no effect at all. You missed all that too?

Mr. **Corey**. I'll be glad to comment on it. Not on Mr. Regan's comment because I don't know what it was, but I'll comment on the fact that——

Senator **Bumpers**. Let's get back to the basic question because right now interest rates are not corresponding to inflation, so why do you think they will in 1990?

Mr. **Corey**. Because right now we're talking about a short-term situation. We're talking about a short-term situation while interest rates are generally agreed, to correspond with inflation expectations.

Now who the hell is going to say what the inflation expectations are today? My expectations are that as long as you fellows keep the deficit up above $200 billion a year that we're going to have some return to inflation and therefore, I've got some money of my own I would like to invest but I'm holding back because I figure that these deficits are going to drive interest rates, and inflation back up and interest rates will come up too.

Now, when inflation gets to 15 and 20 percent, interest rates are going to be up there too, 15 or 20 percent.

Senator **Bumpers**. If they are, then these projections are just something to sit here and speculate on because if interest rates—let me give you another assumption.

You are assuming, No. 1, that this plant will operate at 65 percent capacity, and even light water reactors in this country which we've had for almost 40 years now only operate at 61 percent capacity.

Mr. **Corey**. I just got through testifying before you came in that for the most recent 12 months Commonwealth Edison's light water reactors operated at 64.2 percent capacity factor and they're constrained by a system capacity factor of 44 percent, that their actual equivalent availability for this last 12-month period was 78 percent. This is the figure that's going to govern Clinch River. There will be no system constraints on Clinch River's operations.

Senator **Bumpers**. But you're got a brandnew technology here.

Mr. **Corey**. It's the oldest technology. It's older than the light water reactor.

Senator **Bumpers**. I just came from the Soviet Union and they think breeder reactors are the greatest thing since night baseball. But they're not suggesting that even theirs are operating at 65 percent, and it's very painful for them not to indicate that everything works perfectly there.

Mr. **Corey**. I'm not going to speak for the Soviet Union.

Senator **Bumpers**. How about the Phoenix breeder in France? What capacity is it operating at?

Secretary **Brewer**. The capacity factor, the small Phoenix reactor is about 55 percent, Senator.

Let me contrast that with the experience of EBR-2 which I used to respond to the chairman a minute ago. Seventy-four percent over the past 10 years. There are technical design reasons for a breeder reactor to operate at a higher availability factor. For one thing they plan for fewer outages for refueling and maintenance than in a light water reactor. It's inherent in the technology.

Similarly, our experience with FFTF has been quite exemplary.

Senator **Bumpers**. Mr. Brewer, I'm just trying to demonstrate that if any of these projections are off very much then the revenues that you project, for example ten cents or 11 cents a kilowatt-hour, are not even going to come close to retiring this bond issue.

Secretary **Brewer**. Senator Bumpers, we have chosen the assumptions in this alternative financing plan to be on the pessimistic side—the 11-cent price for electricity outside the TVA region, the capacity factor and so on.

Senator **Bumpers**. Is Middle South Utilities one of the investors?

Secretary **Brewer**. They have expressed an interest in purchasing the power.

Senator **Bumpers**. Do you know what their excess capacity is right now?

Mr. **Corey**. This has nothing to do with it. We're not selling capacity. We're selling energy.

Senator **Bumpers**. You don't sell energy to people who don't want it.

Mr. **Corey**. We've never based any of our projections on selling capacity. We've assumed nobody needed any more capacity. We've assumed that the 11 cents is a minimum price of energy in the Middle South and the Houston and the Georgia Power and the Virginia Electric Power, and in the Carolina Power & Light areas. The capacity has nothing to do with it.

Secretary **Brewer**. If I could respond to your inquiry.

We have data that suggests there is a capacity shortfall in the Southeastern Reliability Council [SERC] region of about 16 gigawatts. That's about 16 plants in the 1990 time frame. We are not depending on that to justify the sale of electricity from Clinch River. The higher avoided cost in the SERC region, that's the southeastern part of the United States, derives from the fact that there is so much oil and natural gas electrical capacity in that area, and therefore the avoided cost is quite high compared to that in the TVA region which has a very large hydro component and a very large coal component.

If we were to include in the price of electricity assumption of premium for capital displacement, then the price would be something like 15 or 16 cents a kilowatt-hour. But we have not done that, for conservative reasons.

Senator **Bumpers**. Mr. Secretary, do you know the average retail cost of power today per kilowatt-hour?

Secretary **Brewer**. It's about 6 or 7 cents.

Senator **Bumpers**. It's 6.21. Why do you think that in 1990 you can sell power at 11 cents per kilowatt-hour, twice as high as it is right now?

Secretary **Brewer**. For one thing, Mr. Bumpers, the 6.2 cents per kilowatt-hour is the system average. We are talking about in our case the avoided cost of generating power.

Senator **Bumpers**. I understand the difference. But you know the other day I sat here with the chairman and we went through this whole WPPSS hearing which was very instructive. It was a real dilemma for me, but one of the things that probably would have caused me not to go for that proposal was that they have such excess power now, and when you finish those plants, they're talking about right now, they have a great excess capacity well beyond 1990.

Secretary **Brewer**. If I could respond to that, there is a vast difference between the Clinch River proposition and WPPSS. In the first place, WPPSS was a commercial undertaking involving more than 5 gigawatts, 5 plants. This is a research and development activity involving less than 1 gigawatt, less than 1 percent of the total capacity in the southeast region at that point in time. In the TVA region, which is the customer in the existing arrangement, there is in fact projected to be a power overcapacity in the 1990's whereas in the SERC region there is an undercapacity and a high component of——

Senator **Bumpers**. Why did TVA just abandon all those nuclear plants down there?

Secretary **Brewer**. An overcapacity situation.

Senator **Bumpers**. You're not talking about selling power to TVA.

Secretary **Brewer**. No, sir; I want to make that very clear.

Senator **Bumpers**. They're trying to sell power to the same people right now because they have an excess capacity. They're trying to sell power to the same people you say you're going to sell power to in 1990.

Secretary **Brewer**. The existing arrangement with TVA does not capture the full commercial value of the Clinch River electricity. It has a very low avoided cost because of the hydro component and for that reason we sought a market elsewhere.

Senator **Bumpers**. Do the utilities, your investor group, do they participate in cost overruns?

Secretary **Brewer**. No, Senator. The plan is if there's a cost overrun on this project between now and the completion of construction the Federal Government would be obliged to cover that overrun, which is exactly the same arrangement we have now and which incurs therefore no new exposure for Uncle Sam.

Mr. **Corey**. The utilities are not investors. They're R&D contributors and they get nothing for their money. They put this money up and put it up with the view to try to promote this research project. But they're not getting anything back out of it, and they're not providing any overruns.

Senator **Bumpers**. Let me give you a series of ideas that I have in my mind and please don't interrupt me. And when I finish you can just all comment any way you want to.

You have put up investors so far have put up $150 million. They are going to put up another $175 million in cash. It's a total of $325 million that they're putting up in cash. In 1990 they're going to issue a billion dollars' worth of bonds guaranteed by the U.S. Government at what you hope will be a 10-percent interest rate.

Now of the $1 billion that that bond issue represents, $675 million of it will be their contribution in excess of their immediate cash payment. In other words they've put up $150. They're going to put up another $175 and they're going to borrow money short term, I got ahead of myself. They're going to borrow money at short term from the banks of $675 million as needed.

It is estimated that their interest cost on that $675 million will be $365 million so their short-term borrowings plus the interest between now and 1990 total $1 billion and they're going to sell a billion dollars' worth of bonds guaranteed to the U.S. Government to cover their short-term borrowing of $675 million plus the interest on that amount.

Now at that point it sounds like a pretty good deal, but at that point, this plant which will be operated by a corporation which is a Federal corporation, will sell them power calculated at the rate of 11 cents per kilowatt-hour, and that will be given to them in effect to amortize the bonds.

I don't want a lot of comment, but so far am I correct?

Mr. COREY. No.

Senator BUMPERS. Where am I wrong?

Mr. COREY. You've been talking about utilities putting up some money and then selling some bonds. This will be the project, and this is a partnership——

Senator BUMPERS. I don't want to get into semantics. I want to stick with the facts.

Mr. COREY. I'm just telling you that the partnership is not going to buy power from the Federal Government. The partnership is going to sell power and it's going to sell power for whatever it can get to the highest bidder.

Senator BUMPERS. Tell me how this bond issue is going to be amortized.

Mr. COREY. It's going to be amortized out of the proceeds of the sale of that power.

Senator BUMPERS. Isn't that what I just said?

Mr. COREY. No, you said that the utilities would be given power for 11 cents and then they could do with it what they want to. That isn't it.

Senator BUMPERS. But you're going to take the money and pay off their bond issue. What's the difference?

Mr. COREY. The partnership has a bond issue, the partnership will sell power. The partnership will get whatever revenues it can get, and it will use the revenues to pay off the bonds.

Senator BUMPERS. Where is the risk? The Government is guaranteeing the bond issue and the corporation is going to pay it off with the power they sell from this plant. So I'm asking you where is the risk?

Mr. COREY. I just told you. There's a good deal of both risk and profit in here.

Senator BUMPERS. What is the risk? The Government is guaranteeing the issue and it's going to take the Clinch River breeder and pay off the bond issue. So where is the utility investor's risk?

Mr. COREY. The utilities are not investors. The utilities are not going to be investors.

Senator BUMPERS. Whoever puts up the money.

Mr. COREY. It will be put up in the marketplace and those people who buy it will have considerable risks. I've enumerated six or eight of them. They are risks that they will not be able to use the tax benefit, the risk that the project may not ever be completed, and when they're caught up with tax recapture that they will not be recompensed for what they've put into it. There are risks that they will be disadvantaged by reason of the project not turning out what we thought. There are risks that maybe the——

Senator BUMPERS. What if this thing fails and never generates a kilowatt of power?

Mr. COREY. If it fails and never generates a kilowatt of power, the first thing that will happen is there will be a tax recapture. Then there will be some kind of an attempt for the Government to make the equity holders whole and I don't know how it's going to be done because——

Senator BUMPERS. Well I do and I say the Government's going to pay off this bond issue.

Mr. COREY. It's a very complicated matter, and I swear to God they're going to end up being screwed.

Senator BUMPERS. So far that may happen, but so far in the history of this country nobody who held the U.S. Government guaranteed bonds has lost a penney.

Mr. COREY. I happen to own some WPPSS bonds, and I'm hoping you're right.

Senator BUMPERS. They are not guaranteed.

Just forget about who's going to invest.

Mr. COREY. I think that may be one of the risks. If the WPPSS bonds aren't guaranteed are these? I'm not quite sure what the courts will say.

Senator BUMPERS. You take away the U.S. guarantee on these bonds and we can dismiss this hearing. We won't have anything further to talk about.

Let me ask you one further question. I'm convinced incidentally at this point that everything I said is absolutely correct. There is no risk.

Second, let's assume just for easy figuring hypothetically that I am the person who's putting up the money. I'm a big utility and I'm just going to put it up all myself.

Mr. COREY. There's no utility money in this.

Senator BUMPERS. Who is going to put up the money?

Mr. COREY. The marketplace. Whoever is willing to buy these things when they're offered for sale.

Senator BUMPERS. You're talking about the bonds.

Who's going to put up this extra $175 million equity capital?

Mr. COREY. It's $150 million and I said in my testimony it might be $250 million or $300 million depending on the——

Senator BUMPERS. I'm sorry, it's $175 that's already been contributed; $150 to be contributed in new equity capital. Who's going to put that up?

Mr. COREY. We don't know. It will be sold in the competitive marketplace.

Senator BUMPERS. In what form? What kind of venture is this going to be?

Mr. COREY. In partnership participations.

Senator **Bumpers**. All right, so I'm a partner. So I've decided to invest in this thing. First of all you've got $325 million in equity capital put up.

Secretary **Brewer**. $325 million in utility contributions with no fiscal return whatever; $150 of which has already been contributed and costed, and another $175 to come.

Mr. **Potter**. In addition to that there's $150 million of what we call disinterested equity capital or equity capital from people like yourself or from institutions.

Senator **Bumpers**. In addition to the $150 that we're talking about here now?

Mr. **Potter**. That's a source of confusion I think Senator Bumpers. This $250. One has already been contributed by the utility companies and these are the people who are obligated to contribute another $175. In addition $150 million of equity that we would raise from the investment community who were drawn to the project just for its return.

Senator **Bumpers**. So instead of $325 we're talking about maybe $475?

Mr. **Potter**. $150——

Senator **Bumpers**. $175 has already been contributed.

Mr. **Corey**. He's right. $475 is a good figure.

Senator **Bumpers**. Do you all want to go out in the hall and talk this over? [Laughter.]

Mr. **Potter**. We're raising $1 billion of new capital, $175 from the utility companies as research contribution; $150 investment community drawn to the equity characteristics of this investment, and a net $675 of debt capital, the bonds that you spoke of.

Senator **Bumpers**. How are these people in the private sector who are going to put up this $150 going to be reimbursed?

Mr. **Potter**. Principally through the tax features of the investment.

Senator **Bumpers**. Does that mean then they're going to get the investment tax credit and a pro rata share on the entire bond issue too for 1990?

Mr. **Potter**. The bond issue——

Senator **Bumpers**. The bond issue is to pay off the short-term bonds. But if I were going to borrow money today to put up this $150 million that you talk about from the private sector am I not also buying myself a tax benefit on the $675 million of short-term borrowing?

Mr. **Potter**. The tax benefit you get relates to the assets acquired both through the equity and the debt.

Senator **Bumpers**. Right, so I get this tax break which is substantially more than my investment, and the investment tax credit and the depreciation on the total investment. I wind up with more taxes and more tax deductions than I have put up. And I also get a guarantee the Government will pay back the $675 million on which I have gotten that tax credit and depreciation.

Mr. **Potter**. Senator Bumpers, this is modeled after, if you will, leverage lease financing which you may be familiar with. Eastern Airlines——

Senator **Bumpers**. I am familiar with it.

Mr. POTTER. Eastern Airlines for example with Merrill Lynch does a lot of this kind of thing. It acquires an airplane for sale, it's let's say $50 million. We raise $20 million in equity capital for people like First Chicago, Manufacturer's Hanover, General Electric, and we raise $30 million from insurance companies in the form of nonrecourse debt, debt like Prudential Life Insurance Co., Metropolitan Life Insurance Co. The equity participants for Chicago gets the tax benefits of the entire airplane, not just 40 percent.

Senator BUMPERS. I've heard that story 8,000 times.

Mr. POTTER. Then you know they're an important client of Merrill Lynch as well.

Senator BUMPERS. I'm going to talk to them about that. [Laughter.]

You have a good company and Greyhound is a good company. What I'm trying to say is that you could not entice investors from the private sector unless they were going to get the tax benefit in this guaranteed loan. That's a fair statement isn't it?

Mr. POTTER. They're going to get the tax benefit related to the private sector portion of the financing.

Senator BUMPERS. So they're not at risk either. They're going to wind up with more tax cut deductions than they put up. I'm trying to make the investors, the utility division or the investors, whoever they are, share the risk. Even on the best scenario, if I just put the very best, put this under the best light possible, they are only going to be putting up 12 percent of the risk. We started out years ago with the private sector putting up 50 percent of this thing. Now we're down to 12 percent and everybody says hurray. And when you analyze the 12 percent it's zero.

Mr. POTTER. I submitted a long statement in writing for the record and in that statement it says that the equity investors were the project to fail, would not receive any return on their investment. That is they put up their money and they get back their money that they put in, net of tax consequences, but they receive no return on it. Now you know that's a big loss because they could have put their money into Treasury bills and earned some interest rate on that during the period. So that is in fact a change from our June 23 task force report. That's a risk.

Second, Greyhound Leasing is the kind of person——

Senator BUMPERS. That could not exist without investment tax breaks.

Mr. POTTER. The kind of person who would invest in such a project is this. We're talking about disinterested investors.

Senator BUMPERS. You and I know that every leasing corporation in this country has been set up to take advantage of the investment tax credit. They don't lease anything unless they get the investment tax credit.

Mr. POTTER. It very much helps allocate resources efficiently and buys a little time for companies who don't have tax liability but that's beyond the scope of this discussion. I will say the Greyhound leasings of the world would invest in this project. They'd put in $150 million not knowing whether or not they would have the income to shelter. I use First Chicago because I'm familiar with them. They made a lot of leverage lease investments in their heydays. They were passing out this money. Then they had loan losses.

Gaylord Freeman, the chairman used to joke we had all kinds of loan officers who knew how to pass out the money but very few who knew how to collect it. His joke turned out to be a little more serious than he anticipated. When that happens all this leverage lease equity investments lost a great deal of value for him. That's an important risk that the equity investors would take.

Senator BUMPERS. The chairman's patience is about to run thin. I think really, Mr. Chairman, I've taken a lot of time but I think we're also covering a lot of ground that we would cover later if we didn't cover it now.

But I wanted to ask Secretary Brewer, do you consider this project risky?

Secretary BREWER. Senator Bumpers, the largest risk that this project has at this point is a continuation of this drawn out chronic annual inconclusive debate that has driven the cost up enormously since 1976 or 1977 by about $1 billion.

Senator BUMPERS. Not the cost but the technology. Is it technologically risky?

Secretary BREWER. In my view, with the degree of testing we have done on the components and on the fuels—we've been working on fuels in the EBR-2 for 25 years—I think it is an acceptable technical risk.

Senator BUMPERS. Why should the Government finance it?

Secretary BREWER. It's a demonstration project for the next step beyond, in fact to reduce the residual technical risk beyond Clinch River.

Senator BUMPERS. Are you familiar with President Reagan's first message to this committee after he took office?

Secretary BREWER. Yes, sir.

Senator BUMPERS. You remember he said the U.S. Government is only going to invest money in energy that is long term, high risk. Now if this is not high risk, why are we putting our money in it?

Secretary BREWER. This is a program, Senator Bumpers, which has a 30-year lead time. You cannot commercialize——

Senator BUMPERS. Every utility plant is built for 30 or 40——

Secretary BREWER. Not the duration of the plant. I'm talking about from now to a point where there is financial and economic and technical confidence such that the plant can be ordered, put in place, and deployed by the natural market forces. This will take at least 25 years. There is another step to go after this in which the Federal Government will not be involved, and that's the large prototype.

Senator BUMPERS. Considering, or putting the very best face on this thing and assuming that somebody is risking 12 percent of the cost of this thing, if it is acceptable and you don't consider it to be high risk, do you think that's an acceptable risk to ask the private sector or any utility group to participate in? Considering we started out so enthusiastic several years ago on a 50-50 basis? Do you think 12 percent is enough?

Secretary BREWER. Let me do a bit of arithmetic. The cost escalation due to forces beyond the control of the project—that is delay, insufficient appropriations, policy debate, et cetera—is about $1 billion. If you subtract that from the $4 billion total capital cost of the project you get a figure like $3 billion.

The proposal before you now will bring in $1 billion plus the $150 million that has already been contributed and spent. That's $1.15 billion. That divided by $3 billion is only 30 percent and we started in 1972 with roughly the same fraction. So the new proposal brings us back to that point if you discount and remove the cost escalation due to factors beyond the control of the project.

Senator **Bumpers**. Let me make three observations for you. No. 1, if this thing has cost overruns, and I don't think there's anybody in this room that believes, unless he needs a saliva test, that there are not going to be cost overruns in this project. And the private sector is not going to participate in that.

No. 2, if any of your projections are off on our side, we pick up the cost of your failed projections.

And, No. 3, if this thing never produces 1 kilowatt we still pay off the billion dollars' worth of bonds.

The **Chairman**. Would you care to respond?

Incidentally, Senator, you got unduly personal when you said I need a saliva test. [Laughter.]

Senator **Bumpers**. I never had the guts to say it out loud before. [Laughter.]

The **Chairman**. With respect to risk, those of us who have been associated with the project over the last several years, and I've been intimately acquainted with it, could certainly say compared to the political risks associated with completion of this project, the perils of Pauline look like a chronicle of stability. I've been there Senator, and I'll tell you, there's been risk in every step and continues to be risk. Not technological, not the fall of the science, the fall of the politicians. If you want to look at the cost overrun, it's because the technicians, the failure of their projections, it's the fault of the politicians. If you want to look at the cost overruns and the reasons they run up, look at the delay which was the fault of the politicians.

So if somebody needs a saliva test around here we'd better be looking at why it is. The question was asked a moment ago with respect to why do we have to have an R&D program? To convince skeptics that indeed this can be done.

As a matter of fact, reference was made to WPPSS. Again, there are adequate reasons why that whole situation turned out to be bad. Delay and cost of interest were the primary driving forces that caused that particular collection of projects to go bad. Delay and interest rates. Delay largely caused by Government, interest rates almost totally caused by Government. So if we've got some skeptics on the other side of the table, we want some insulation against the risk, I'd suspect maybe they're looking in the right direction when they look up here and find out where the risk lies.

Yes, there is cost overrun. I drive a 1969 car. It happens to be a superior model.

Senator **Bumpers**. The chairman of the Energy Committee is driving an old gas guzzler.

The **Chairman**. In many respects it's better than the ones, the models they build today. Better in my judgment. That's why I drive it. I like it. But that same car today if you could just go by the equivalent model, that same car is more than four times today what it was in 1969. If I could get that for it but it's got a few miles on it now which is another way of saying it's unfair to look at cost overrun in comparison with initial projected cost and current projected cost. There's lots of changes in the last several years.

We had 4 years of almost total moratorium on progress of this project during the Carter administration. It was a hard fought battle to keep him from killing it outright. We kept it alive. Keeping it alive costs money. It's not the technicians' fault, not the fault of the technology, not the fault of the utilities that were involved, but the fault of Government.

If this had been built according to the original schedule and been on-line it could be demonstrating today to the skeptics today what it could do.

Some reference was made a few minutes ago to the fact that this is an untried technology and there was response on the other side of the table, I'd like to expand on a little bit because experimental breeder reactor number one is a national historic landmark today in the deserts in Idaho. It produced the first electricity to go on a commercial power grid and light up the lights in Idaho.

EBR-2 that follows it, I think Secretary Brewer has already indicated and has in the last ten years a very high record of availability. And it's an experimental reactor, not a demonstration one. It's one that's constantly changing its mode of operation and its fuel loads in order to test and to verify the results of tests on different kinds of fuels and different operating conditions. And in spite of that constantly shifting mission the availability and on-line performance has been better than the LWR's. I don't think we need to be so much concerned about whether this is a new technology as would be less reliable than LWR's. There are some inherent reasons why the availability if not reliability perhaps availability is a better way to state it, may well prove to be higher than LWR's. That's one of the reasons the United States has—in demonstrating this technology. That's why the utilities that are involved in making contributions have a stake in making contributions so indeed we can demonstrate what this technology can do under operating conditions.

Mr. O'Connor, I thought I detected in you a desire to make a comment a moment ago. We were talking about risk and exposure and the rewards to the people that are involved as partners in this project.

Mr. O'CONNOR. As has been indicated, the utility industry has pledged roughly $325 million and I think it is important to point out this has never been an equal cost sharing kind of arrangement for those of us who were there at the time. The agreement was made to make that commitment of up to $325 million which is a commitment we have honored in full. And to hold together 753 different entities, and industry is not always known for its togetherness. It's really quite unique in its willingness to stand behind that pledge. Really all we're asking for is that the Government honor its pledge to complete this project and work with us toward that goal.

We're really foreclosed out of a lot of options that otherwise might be available to us. A number of hydro sites which has virtually been eliminated. Gas is no longer an option for producing power. Oil is no longer a sensible long-term option for producing energy. We're really down to nuclear and coal. Coal has its problems, nuclear has its problems. So what we're looking for is a long-term strategy that will help us to have a virtually inexhaustible source of supply for a century or beyond, and the breeder represents that opportunity for us.

Secretary Brewer talked earlier about the three main options that were left available to us, fusion, solar a-d breeder reactor, and the one with the highest confidence that we can utilize well into the 2lst century is the breeder reactor. But in order to get there we need Clinch River. So Clinch River contains a lot of the answers to satisfying a national mandate and it charges to do all we can to come up with a virtually inexhaustible supply of energy for decades to come. That's why it's important. Not just for the utility industry, but for the Nation as a whole.

The **Chairman**. Thank you.

Senator Nickles.

Senator **Nickles**. I appreciate your indulgence and also endurance.

Mr. Brewer, I apologize for missing your statement, and therefore I'm going to ask you a question that possibly would help me.

I was following most of what Senator Bumpers said as far as the program. Could you outline quickly, because I'm not sure, I saw when he was going through it, I saw some head shaking and some no's. If you're coming by my office could you give me a 3 minute rundown on what the new proposal is? Could you or Mr. O'Connor?

Secretary **Brewer**. I would be happy to Senator Nickles. My statement brought the support of the Department on the financing plan which we feel will jetison about $825 million of Federal outlays over the next 7 years perhaps more, with very little——

Senator **Nickles**. Just real quick you lack what?

Secretary **Brewer**. $2.5 billion is the cost estimate to go from this point forward.

Senator **Nickles**. How much do we have in it right now?

Secretary **Brewer**. $1.5 billion has been spent by the Federal Government.

Senator **Nickles**. Out of that one and a half the private has 175?

Secretary **Brewer**. $175 million; yes, sir. I'm sorry about $150 million has been spent from the private sector so far.

Senator **Nickles**. So the Federal Government has in it right now 1.35?

Secretary **Brewer**. No, we're doing a little bit of rounding here. The sum cost is about $1.6 billion and change and the private contribution to date is about $150 million so we're talking about a Federal cost of $1.5 billion, plus or minus $50 million.

Senator **Nickles**. And to complete we have what, 2.5?

Secretary **Brewer**. Yes, $2.5 billion.

Senator **Nickles**. The 2.5 is 1 billion quote private, 1.5 Federal?

Secretary **Brewer**. And a one-time appropriation of $1.5 billion from the Treasury. And that totals $2.5 billion to go.

Now I can break down the 1 billion of new private investment. That is composed of $175 million of continued BRC contribution without any fiscal return. $675 million in debt capital, and $150 million in equity capital. Now, if I've done the arithmetic right, it should total $1 billion.

Senator Nickles. Right now as far as the status a lot of components have been ordered, have been delivered, have been built, but you're really in the process of breaking ground?

Secretary Brewer. Senator, we broke ground last year and that is completed now. Last week or the week before last we completed the excavation for the NSSS. More than 70 percent of the equipment has been placed on order, has been costed, and one-half of that has been delivered. Furthermore, over 90 percent of the design or more is complete which is uncharacteristic at this stage.

Senator Nickles. What are the termination costs? If it's terminated today, what would be the cost to the Federal Government?

Secretary Brewer. The termination cost would be several hundred million dollars. There is a question about the termination expense. If we are sued in court by the contributors who have already contributed $150 million, then there will be termination expenses associated with closing out the contracts and pension plans and that type of thing. So about $300 million or more.

Mr. Corey. Could I interrupt just 1 second?

Mr. Brewer has done very careful studies on this and I have testified that, and this wouldn't be allowed in any courtroom, but I talked with Bob Nathan, an old friend, an outstanding economist here in Washington and once an economic adviser to FDR in the 1930's, and Bob says we're at least at $500 million termination costs when you consider the secondary costs.

Secretary Brewer. Senator, that's $150 million minimum in simply closing out contracts.

Now above that is a matter of legal dispute.

Senator Nickles. Mr. Potter, I didn't quite understand, I'm not in on leasing companies, let me ask you a question. I have $1,000, I want to invest it as part of the $675 million. Now what type of tax deduction or credit will I receive if I make this $1,000 investment?

Mr. Potter. None.

Senator Nickles. I thought I heard some things and I thought I saw you shaking your head no when Senator Bumpers was talking to you that I would receive deductions greater than that investment. I'm interested in how I can do that.

Mr. Potter. Senator Bumpers gave an accurate recital of the amount of tax benefits available. He used the words a little differently than we do. It's the assets, not the bonds that provide the tax benefits. But it's just the other side of the balance sheet.

Senator Nickles. The 675, oh, OK. You're saying the 150, the equity portion.

Mr. Potter. Has a tax benefit associated with that too, so a total of 825 million dollars' worth of assets on which you receive tax benefits.

Senator Nickles. So on the 150 plus——

Mr. Potter. The 675 would be 825.

Senator Nickles. On the 675 you're going to get investment tax credit in 5 years?

Mr. Potter. The bond holders are not going to receive such tax benefits.

Senator Bumpers. The U.S.-guaranteed bond is what you're getting. Is that not fair to say?

Mr. **Potter**. The equity investors get tax benefits associated with assets. In this instance the amount of assets totals $825 million.

Mr. **Corey**. Would it be all right if I made a supplemental comment?

Senator **Nickles**. I'm going to ask you the question. You said you had some money to invest, I was going to ask you if you were going to invest any.

Mr. **Corey**. I'd better not or I might go to jail I think. It's a conflict of interest.

But seriously, I would like to see if I can make this a little simpler than it has been. We're talking, let us assume we get an adverse ruling that says we have to capitalize the interest, so we don't have to worry about interest during construction. Now we have roughly not $875, it's $825 million dollars of total, well we've got $825—no $675 million dollars of bonds. We've got the interest capitalized of roughly $365 million dollars. Well we end up with $1.04 billion in bonds and $150 million of equity, so that's $1.190 billion, and we've got an investment tax credit on that of roughly 119——

Mr. **Potter**. We don't get investment tax credit.

Mr. **Corey**. What I'm trying to say is this, Senator Bumpers had said, "and now you're going to get all of this depreciation," but offset against that depreciation is the fact that we're going to have to pay taxes on the same amount of money which is the retirement of the bonds. The money that comes in to retire the bonds, which is equivalent to the depreciation—or roughly so—will be part of the taxable income to the equity owners. So for all practical purposes, as far as depreciation is concerned the tax benefits are entirely a question of timing. The amount of money is zero.

Senator **Nickles**. Mr. Brewer, I have had a chance to go over the CBO's working paper. I don't know if you have or not. We heard Mr. Corey's comments on it and I'm not asking for any detailed explanation. And again I haven't read it or seen what else but I'm assuming it's somewhat unfavorable to the project.

Secretary **Brewer**. It's not only unfavorable, it's not even germaine or relevant for the following reason: Our instructions in the continuing resolution that the Congress laid down in December of last year were to seek reduction in Federal outlays by greater private participation. We have done that with the one million investment. We were not instructed to look at continuing a Federal project.

Now if you want to write me a check for $2.5 billion and continue the project as a Federal undertaking, then the CBO analysis is germaine to the issue.

Senator **Nickles**. So they compared it to full Federal funding as compared to the new alternate plan?

Secretary **Brewer**. Yes sir, but they took credit for a higher revenue base outside the TVA region which is a fundamental feature of our plan. We go outside the TVA region and we get a higher avoided cost revenue.

Senator **Nickles**. So all together we're going to end up with you mentioned the 4 billion plus investment and the revenue stream, when would it be online as far as producing revenue?

Secretary **Brewer**. 1990.

Senator NICKLES. And what type of annual net revenues are we talking about?

Mr. COREY. $110 million under our plan; $35 million under full Federal funding, assuming lower electricity output and sale at TVA rates.

Senator NICKLES. So we're looking at a discrepancy of what some people say you'd be able to generate net revenues of $35 million and others are saying $110 million?

Mr. COREY. No, sir, under our plan we'll get $110 million net revenues a year available for debt service. If it's full Federal funeling and it's all from the Federal Government and if the power's Federal power and it's sold to TVA and we don't get quite as much power because we don't have the efficiency incentives, then we'll get $35 million a year. Our plan has enhanced the net revenue available for debt service and hence ultimately available to the Treasury by $75 million a year.

Senator NICKLES. That $110 million, let's say we went that route and we were to have $110 million of net revenue per year, would that originally be used——

Mr. COREY. It supports the billion forty of revenue bonds. $1,040,000,000 of revenue bonds. It pays it off over 30 years. And if we get inflation and 110 million moves up, it will be used to pay off the loans early.

The CHAIRMAN. Senator Murkowski.

Senator MURKOWSKI. Thank you. I want to clear up a couple of things if possible.

First of all this will be a $4-billion project and we're looking at $2.5 billion more which includes this package, 675 million dollars' worth of debt plus two in effect equity contributions. So you're really going to need a billion and a half more.

Mr. COREY. It's a net cost of $1 billion.

Senator MURKOWSKI. As I see the dilemma, Mr. Brewer, how many Secretaries have been involved to your knowledge in the Clinch River breeder reactor?

Secretary BREWER. It goes back further than——

Senator MURKOWSKI. Roughly.

Secretary BREWER. 1972 to the present. And that has been I don't know how many Congresses and there have been four Presidencies since then.

Senator MURKOWSKI. And you've indicated in your testimony as a consequence of this lack of continuity of the Federal Government that perhaps it has escalated as much as a billion dollars?

Secretary BREWER. I would like to submit for the record a more precise analysis. There have been, as well, regulatory effects which have delayed and escalated the cost as well as internal design change.

[The material follows:]

Historical Summary of Appropriations

FY	Proposed Project Office	DOE	Administration	Congressional Approved	Cost Impact of Funding Reduction
74	100.3	N/A	100.3	100.3	
75	53.4	N/A	53.4	53.4	
76	152.5	N/A	107.0	107.0	90.0
76T	29.0	N/A	24.1	24.1	
77	237.6	N/A	237.6	237.6	
78	234.8	N/A	234.8 (1) 150.0 (2)	80 0	27.0
79	242.1	-0-	13.4 (3)	172.4	837.0 (6)
80	284.0	-0-	-0-	172.4	
81	196.9	-0-	-0-	172.0	
82	254.0	-0-	-0- (2) 254.0 (4)	193.9	
83	252.5	255.8	252.5	193.9	14.0
84	401.8	370.0	270.0 (5)	-----	-----
				TOTAL	968.0

(1) Ford Budget
(2) Carter Budget
(3) Requested for Termination
(4) Reagan Budget
(5) Alternative Financing Budget
(6) Due to National Policy Debate Delays

HISTORY OF CLINCH RIVER COST INCREASES

	DELAY (Months)	COST OF DELAY (Millions of YOE $)	CRITICALITY	COST (Millions)
1974			July 1982	1,736
	Due to Funding Limitations			
1974 to April 1977	12	117[1]		
National Policy Debate (April 1977 to September 1981)	56	837[1]		
FY1983	1	14[2]		
Sub Total	69	968		
	All Other Causes			
NRC/Licencing Requirements	7	218[1]		
Design Changes/ Hardened Estimates	—	289[1]		
Impact of Delaying Start of Site Work Combined With FY 82 Funding Limitations	12	235		
Other Increases Attributable to Project	—	179		
Sub Total	69	921		
Total	88	1,889	October 1989	3,625
Alternate Financing Plan Contingency for Start-up and Operation	—	160		

[1] DOE/IG-0185 USDOE Inspector General "Report on Audit of the Clinch River Breeder Reactor Plant Project," dated July 21, 1982.

[2] CRBRP-Project office.

Senator MURKOWSKI. In any event the Federal Government is looking at a combination of a guarantee of debt. I didn't understand totally the acknowledgment of Mr. Potter to Senator Bumpers on the realities of this guarantee. I'm inclined to think there is in effect the application of a guarantee on this debt. But what we're faced with, at least from the standpoint of my own perception, is a project that has had a lot of captains and it has gone aground many times, and we're asked to do a combination of appropriation of somewhere in the area of the difference between $2.5 million and whatever your combined equity package is which we agree is a million dollars. And it's a Government project and Government projects like this don't go well. And I believe we have Mr. O'Connor who represents some 753 electric systems nationwide and is an expert and a proponent of the private sector, and I would like to know if you gentlemen individually or collectively have thought of some way of approaching this project and taking the inefficiencies of the Government out of it. So if we prevail upon the continued funding of money we could somehow eliminate the extraordinary duplications associated with the inconsistencies of the Government in the process. Because I'm personally convinced the technology has an application, if for no other reason than the problems we're having in storing nuclear waste from our conventional nuclear reactors.

What is it, we use the 235's and the 238's which you use, and I assume there is a considerable cost savings to be realized from that. It's probably very difficult to relate to what that actually is in the offset of this cost.

I have a hard time sitting here as a relatively new Member of Congress debating on something we acknowledge has been mishandled up to a billion dollars, one-quarter of the cost.

I would like to suggest particularly to Mr. O'Connor, is there a better way to structure this mousetrap so at this late stage, so that we who have to basically support the continued funding on the guarantee or both, aren't exposed to the irresponsibilities associated with what I think is conceptionally a worthwhile effort?

I came out of the private sector and know how you think. I recognize when Government offers itself up and can be used you use it. I'm frankly very reluctant to continue in a manner where I can't measure what the exposure to Government is to fund a project or guarantee a project where it's open end. Can you tell us how to close it?

Mr. O'CONNOR. I think we have the scheme to do that, Senator, in place now.

Senator MURKOWSKI. Would you be willing to take it on the basis of your associations in effect guaranteeing a price certain to finish it?

Mr. O'CONNOR. It's a Government job, Senator.

Senator MURKOWSKI. When you tell me it's a Government job you're telling me the responsibility is Government.

Mr. O'CONNOR. Let me tell you why. I have some degree of confidence and it draws primarily off my experience as head of the company, the largest nuclear program in the country. We have seven operating plants and five more under construction, all of which have been built or are being built at among the lowest rates per kilowatt against all capacity of any company in the country. This plan is over 90 percent designed. Over 98 percent of the R&D work for the project has been completed.

Senator MURKOWSKI. You don't think there are any major change orders coming in?

Mr. O'CONNOR. No, sir; but what has stopped us has been the stop and start nature of the Government's commitment throughout the project and when we were told 6 years ago that Clinch River would never be built or licensed it was a jolt from which we never have really recovered.

What we need is a commitment that takes us beyond the year-to-year Government kind of support. We need something that says we will see this project through to completion. This scheme which provides for a one shot total commitment to the project and provides for roughly 40 percent of the total remaining expenditures to be provided from private participation can get us there and it also has the incentives for governmental support that are required to make sure that we meet the targets that have been set.

We are confident that it can be done if we're willing to make the commitment now, because it should be done, and not expose ourselves 12 months from now or 24 months from now as we have in the past.

Senator MURKOWSKI. Are you certain enough of that to basically pursue some type of responsibility, whatever the nucleus of the organization is in the private sector, that you would be willing to assume any overruns on the project?

Mr. O'CONNOR. No, sir.

Senator MURKOWSKI. This has been the problem. If we come up and say here it is and you state on your reputation it's going to work and the cost is in line, you know, this is a problem I have.

Mr. O'CONNOR. Senator, I'm running the project but we have agreed to put in the $325 million and to provide whatever technical support that we can as an industry and that will be provided.

Senator MURKOWSKI. The last question, can you address the issue of providing a greater degree of comfort if you will, a position of the Federal Government in this project as you have revamped it, which as you indicated will provide a commitment for its finality but still provide some assurance that the Government is just not hanging out there if you're wrong.

Mr. O'CONNOR. We honestly believe that the plant will be completed in the timetable that's been set forth.

Senator MURKOWSKI. I would be inclined to agree with you if it weren't a Government project. If it were private sector. But very frankly I have grave doubts, the Government by its very nature has the capability to do what you feel comfortable with.

Mr. O'CONNOR. I think one way to help us assure that is to help us make the commitment to complete the project and I think that will help the schedule.

Mr. COREY. I have some testimony prepared a few weeks ago and have not put it in before, but I gave this serious consideration in connection with the development of our plan, and, No. 1, I believe that multiyear one shot up or down funding of this matter will save us about 25 percent on the construction costs.

Now the reason we cannot go further and say OK, we the utility industry will take it over, is because of the nature of State regulation in this country which is a heads-I-win-tails-you-lose situation. If there's an overrun it will come out of the stockholders' hides and if there's an underrun it will be credited to the ratepayers, and there is no way in which you could take on this kind of a risk under that kind of a regulatory situation. It's a very unfortunate situation.

Senator MURKOWSKI. Maybe we ought to change the rules then because if we had given you $2 billion when we started this project it would be done and it would be operational.

The CHAIRMAN. In essence that's what we're trying to get done now.

Senator Bradley.

Senator BRADLEY. Thank you Mr. Chairman. I won't ask many questions. I know a lot of the territory has been covered, but I would like to ask Mr. Brewer, let's assume that Face the Nation no longer wanted to invite Secretary Hodel and certainly no longer wanted to invite Secretary Watt as a guest and invited you to come on to face them on Face the Nation. You were under certain time constraints, and the person who was asking you questions said, "We see that we've committed $1.6 billion already to Clinch River. There is a proposal that the Federal Government contribute another 1.5 and there is supposed to be some arrangement for a billion in private markets. How would that work?"

What would you say?

Secretary BREWER. I would say that we're reducing the cost to go from the Federal Treasury by 40 percent, and by so doing we are insulating the project from the chronic annual appropriations uncertainty it has suffered over the past 10 years.

Senator BRADLEY. I don't mean this to you personally, but do you think this would be a good thing to invest in?

Secretary BREWER. Yes, if there is an elimination of the annual appropriations debate and we can get on with construction and get it completed.

Senator BRADLEY. One last question; maybe I should ask it directly because I don't fully understand how this thing works. I know I'm going to be in a town meeting somewhere in New Jersey and, if I vote for this, somebody's going to stand up and say, "Senator, you voted for this, how does it work?"

Now what am I going to tell them? I don't understand it.

Secretary BREWER. Let me see if I can explain it very quickly as I would on 60 Minutes.

First of all there's $2.5 billion yet to be spent. $1.5 billion would come from Federal appropriations in a one time up or down vote. Second, a billion dollars from private sources composed as follows, and this is an illustration: $150 million of equity, $675 million in bonds, and the completion of the BRC pledge which bears no fiscal return of $175 million. That totals $1 billion.

Now accompanying that transaction is the need to guarantee or warrant the investors against further Federal vascillation, termination or attempted termination of the project or a project slip or a technical failure. These are all contingent liabilities which are now the obligation of the Federal Government under the existing plan which would become contingent liabilities under the new plan.

So it's a good deal.

Senator **Bradley**. Well, I don't know.

Thank you Mr. Chairman.

The **Chairman**. The answer was shorter and more pregnant.

Thank you very much. I think perhaps we might add just one other matter. Because we've dealt a great deal with cost overrun, the question of why indeed the costs have been there which might then shed a little light on why the people that are on the other side of this project want some assurance from Government that they've demanded in this package. As I recall the Inspector General's office made an analysis on the cost escalation of the project. That analysis was released in July of 1982. As I remember that Inspector General's report it said that the costs incurred as a result in the delays in the plan have been 57 percent due to policy debate and 35 percent due to licensing changes with the impact on design, am I correct?

Secretary **Brewer**. Yes, sir; that's essentially correct.

The **Chairman**. If you were to expand that answer I would welcome it if indeed my summary was inaccurate, I would welcome some further answer for the record.

Secretary **Brewer**. I would like to provide this table for the record, Mr. Chairman.[1] To get to the bottom line the national debate from 1977 to 1981 resulted in a cost increase of $837 million. Cost increases from 1974 up to that point, resulting from NRC and design changes within the projects, were about $117 million. Well, more than half of the cost escalation since 1972 is attributable to forces beyond the control of the project or the technology.

The **Chairman**. Thank you very much.

Next we'll hear from a panel, Mr. Rudolph Penner, Director, Congressional Budget Office; Dexter Peach, Director, Division of Resource Community and Economic Development, General Accounting Office; and Alvin Kaufman, Senior Specialist, Congressional Research Service, Library of Congress.

Might I say to each member of the panel, your entire statement will appear in the record in full. You are invited to summarize in whatever way you desire at this point.

STATEMENT OF HON. RUDOLPH G. PENNER, DIRECTOR, CONGRESSIONAL BUDGET OFFICE

Mr. **Penner**. Thank you very much Mr. Chairman. I am pleased to appear before you today to discuss the proposed financing plan for the Clinch River breeder reactor. The staff of CBO has analyzed the financial implications of this plan for the Federal Government. Our analysis deals only with alternative financing options, and does not address the value of the project itself or the decision about whether it should be completed.

Our analysis focuses on two basic options: On the one hand, the private financing plan developed by the Breeder Reactor Corporation task force and endorsed by the administration; and on the other hand, an alternative that I will call the "Government-financed" plan. The latter assumes:

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[1] See previous insert, p. 208.

No additional private sector contributions, other than the $175 million already committed by public utilities;

Federal funding of an additional $2.3 billion in construction costs;

Continued Government operation of the reactor through the year 2020, and sales of power at market rates throughout the period; and

Completion of the project at the same cost and at the same time as assumed for the BRC private financing plan.

This Government-financed alternative differs from the current arrangements governing the Clinch River project only in that it assumes continued operation past the first 5 years, and the sale of power produced by the reactor at market rates throughout the period. This would demand a change in the current contractual agreements, which require the Tennessee Valley Authority to buy the power produced by the reactor for the first 5 years at avoided energy costs. This restriction could, at the discretion of the Congress, be maintained or removed regardless of which financing plan is selected. Therefore, in comparing the two basic alternatives, the same power sales were assumed for both.

Our analysis also assumes that the Tennessee Valley Authority would not exercise its option to purchase the reactor after 5 years of operation. In view of its projections of excess capacity, the TVA has indicated that it would probably not acquire the plant.

Under these assumptions, the BRC plan would reduce Federal budget deficits between 1984 and 1990 by close to $700 million, but would add $2.6 billion to the deficit over the following 30 years, as compared with the Government-financed alternative. Thus, the budgetary effect of the BRC plan is to reduce deficits in the early years at a cost of larger deficits in later years.

Because the value to the Government of receiving $1 in the future is less than the value of receiving the same dollar now, an evaluation of this trade-off requires a discounting of future outlays and revenues to put all cash flows on an equivalent basis, regardless of the year in which they occur. When discounted, at the after-tax cost of Federal borrowing, the cost of the private plan is almost $250 million more than if the Congress chose to fully fund the project. This indicates that the short-term savings from the BRC plan do not offset the higher costs to the Government over the life of the reactor.

The higher cost of the private plan reflects the fact that the Government would be borrowing funds from the private sector and paying a guaranteed rate of return higher than normal Government borrowing costs.

Under the BRC plan, assuming $150 million in equity participation, our base-case assumptions imply that the aftertax rate of return earned by the equity investors would be about 37 percent, while the aftertax rate of return for bondholders would be 7.5 percent. The difference between these rates and the Government's assumed after-tax discount rate of about 6.75 percent accounts for the higher long-term cost to the Government of the BRC plan.

Later, Mr. Chairman, if you would like, I can answer Mr. Corey and state why it is appropriate to use the after-tax rate of discount in this case.

The exact tax treatment of the equity investment under the BRC plan is somewhat uncertain, and will depend upon legislation or rulings by the Internal Revenue Service. Our analysis assumes treatment favorable to the investors—especially, depreciation taken over 5 years and the expensing of construction interest. If, instead, we were to assume that the project is depreciated over 10 years and that construction interest is capitalized, the estimated rate of return to the equity investors would be about 23 percent, which is approximately what the financial community has indicated would be necessary to attract investment capital. The rate of return could also be reduced below 37 percent if the plan attracts more than $150 million in equity participation. For example, with an equity investment of $300 million, the rate of return to the investors would be about 14 percent. To the extent that the return to the equity investors is below 37 percent, the cost of the BRC plan to the Government would be reduced. It should be stressed, however, that as long as returns to the equity and bond holders exceed the Government's discount rate, the BRC plan will cost the government more than the Government-financed alternative.

Our analysis is based on an assessment of the tax benefits that private investors would receive under the BRC plan from the investment tax credit and from depreciation and interest deductions. We have also estimated taxes the investors would pay on their income from the project. The results have been tested under varying assumptions about the tax treatment of the private investors, the amount of income from the sale of electricity, and the discount rate used in the analysis.

The cost of the BRC plan is lower than that of the Government-financed plan under only one of the scenarios analyzed. That scenario assumes that, with Government financing, power would be sold at a below-market price to the Tennessee Valley Authority for the first 5 years of the reactor's operation, as specified in current agreements. On the other hand, it assumes that power sales under the private plan would be at a market price. It is not apparent, however, why the restriction on power sales should necessarily be maintained in one case, but not in the other. Therefore, the choice of financing mechanism should not be affected by this assumption.

In sum, the CBO analysis indicates that, if the Government is to proceed with the Clinch River breeder reactor project, direct appropriation of the necessary additional construction funds would be more economical to the Government in the long term than the BRC's private financing plan.

Mr. Chairman, this concludes my statement this afternoon. More detail on this analysis appears in the staff working paper that we have provided to this committee. I will be happy to answer any questions you or members of the committee may have.

[The prepared statement of Mr. Penner and the staff working paper follow:]

STATEMENT OF HON. RUDOLPH G. PENNER, DIRECTOR, CONGRESSIONAL BUDGET OFFICE

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Our analysis focuses on two basic options: on the one hand, the private financing plan developed by the Breeder Reactor Corporation (BRC) Task Force and endorsed by the Administration; and, on the other hand, an alternative that I will call the "government-financed" plan. The latter assumes:

o No additional private sector contributions, other than the $175 million already committed by public utilities;

o Federal funding of an additional $2.3 billion in construction costs;

o Continued government operation of the reactor through the year 2020, and sales of power at market rates throughout the period; and

- Completion of the project at the same cost and at the same time as assumed for the BRC private financing plan.

This government-financed alternative differs from the current arrangements governing the Clinch River project only in that it assumes continued operation past the first five years, and the sale of power produced by the reactor at market rates throughout the period. This would demand a change in the current contractual agreements, which require the Tennessee Valley Authority (TVA) to buy the power produced by the reactor for the first five years at "avoided energy costs." This restriction could, at the discretion of the Congress, be maintained or removed regardless of which financing plan is selected. Therefore, in comparing the two basic alternatives, the same power sales were assumed for both.

Our analysis also assumes that the Tennessee Valley Authority would not exercise its option to purchase the reactor after five years of operation. In view of its projections of excess capacity, the TVA has indicated that it would probably not acquire the plant.

Under these assumptions, the BRC plan would reduce federal budget deficits between 1984 and 1990 by close to $700 million, but would add $2.6 billion to the deficit over the following 30 years, as compared with the government-financed alternative. Thus, the budgetary effect of the BRC plan is to reduce deficits in the early years at a cost of larger deficits in later years.

Because the value to the government of receiving a dollar in the future is less than the value of receiving the same dollar now, an evaluation of this trade-off requires a discounting of future outlays and revenues to put all cash flows on an equivalent basis, regardless of the year in which they occur. When discounted, at the after-tax cost of federal borrowing, the cost of the private plan is almost $250 million more than if the Congress chose to fully fund the project. This indicates that the short-term savings from the BRC plan do not offset the higher costs to the government over the life of the reactor.

The higher cost of the private plan reflects the fact that the government would be borrowing funds from the private sector and paying a guaranteed rate of return higher than normal government borrowing costs.

Under the BRC plan, assuming $150 million in equity participation, our base-case assumptions imply that the after-tax rate of return earned by the equity investors would be about 37 percent, while the after-tax rate of return for bondholders would be 7.5 percent. The difference between these rates and the government's assumed after-tax discount rate of about 6.75 percent accounts for the higher long-term cost to the government of the BRC plan.

The exact tax treatment of the equity investment under the BRC plan is somewhat uncertain, and will depend upon legislation or rulings by the Internal Revenue Service. Our analysis assumes treatment favorable to the investors--specifically, depreciation taken over five years and the expensing of construction interest. If, instead, we were to assume that the project is depreciated over ten years and that construction interest is capitalized, the estimated rate of return to the equity investors would be about 23 percent, which is approximately what the financial community has indicated would be necessary to attract investment capital. The rate of return could also be reduced below 37 percent if the plan attracts more than $150 million in equity participation. For example, with an equity investment of $300 million, the rate of return to the investors would be about 14 percent. To the extent that the return to the equity investors is below 37 percent, the cost of the BRC plan to the government would be reduced. It should be stressed, however, that as long as returns to the equity and bond holders exceed the government's discount rate, the BRC plan will cost the government more than the government-financed alternative.

Our analysis is based on an assessment of the tax benefits that private investors would receive under the BRC plan from the investment tax credit and from depreciation and interest deductions. We have also estimated taxes the investors would pay on their income from the project. The results have been tested under varying assumptions about the tax treatment of the private investors, the amount of income from the sale of electricity, and the discount rate used in the analysis. The cost of the BRC plan is lower than that of the government-financed plan under only one of the scenarios analyzed. That scenario assumes that, with government financing, power would be sold at a below-market price to the Tennessee Valley Authority for the first five years of the reactor's operation, as specified in current agreements. On the other hand, it assumes that power sales under the private plan would be at a market price. It is not apparent, however, why the restriction on power sales should necessarily be maintained in one case, but not in the other. Therefore, the choice of financing mechanism should not be affected by this assumption.

In sum, the CBO analysis indicates that, if the government is to proceed with the Clinch River Breeder Reactor Project, direct appropriation of the necessary additional construction funds would be more economical to the government in the long term than the BRC's private financing plan.

Mr. Chairman, this concludes my statement this morning. More detail on this analysis appears in the Staff Working Paper that we have provided to this Committee. I will be happy to answer any questions you or members of the Committee may have.

COMPARATIVE ANALYSIS OF ALTERNATIVE FINANCING PLANS FOR THE CLINCH RIVER BREEDER REACTOR PROJECT

Staff Working Paper

September 20, 1983

Congressional Budget Office
Congress of the United States

This study was prepared by the staffs of the Natural and Physical Resources Cost Estimates Unit of the Budget Analysis Division and the Tax Analysis Division of the Congressional Budget Office at the request of the Subcommittee on Energy Conservation and Power of the House Committee on Energy and Commerce. Questions regarding this analysis may be addressed to Jeffrey Nitta (226-2860) or Robert Lucke (226-2720).

As mandated by the Congress, the Department of Energy has transmitted a new plan for financing the Clinch River Breeder Reactor Project (CRBRP) involving greater participation from the private sector. At the request of the Subcommittee on Energy Conservation and Power of the House Committee on Energy and Commerce, the Congressional Budget Office (CBO) has prepared an analysis of the proposed financing plan, assessing its long-term impact on the federal budget compared to the alternative of full federal funding of the remaining costs. This paper describes the background of the new financing plan and the CBO analysis of its budget impact.

BACKGROUND

The CRBRP was authorized in 1970 and initial appropriations were provided in 1972. The cost of the project was estimated in 1972 to be $699 million, based on manufacturers' conceptual designs. In 1973, utilities committed themselves to pay $257 million plus interest to the CRBRP. The Department of Energy now estimates that interest will raise the utility commitment to more than $340 million. After detailed cost estimates and reference designs were completed in 1974, the estimated costs of the project rose to over $1.7 billion, assuming operation in 1982. Funding restrictions, delays, licensing requirements, and cost reestimates have since raised the estimated costs to over $4 billion, of which nearly $1.7 billion has been spent. In the Further Continuing Appropriations Act for Fiscal Year 1983, the Congress directed the Department of Energy to report on options to secure additional private sector participation in the CRBRP that would reduce the federal budget requirements. An initial report was submitted in March, and a second more detailed plan was submitted in early August. No funds were included in the Energy and Water Appropriations Act of 1984 for the CRBRP pending action on private financing. Work continues, however, on site preparation activity.

Responsibility for the CRBRP is governed by contractual agreements involving the Department of Energy, the Commonwealth Edison Company, the Tennessee Valley Authority (TVA), and the Project Management Corporation (PMC). The latter represents the interests of contributing utilities in the management of the project. The Breeder Reactor Corporation (BRC) was established to represent the electric power industry in providing assistance and support to the project.

Under present working agreements, if the project is to be completed by 1990 as currently planned, the government will be responsible for providing an estimated additional $2.3 billion to complete construction. As part of their original commitment, utilities (through the BRC) are obligated to provide an additional $175 million. 1/ The TVA is required to purchase power generated by the CRBRP for the first five years of the project's operation, and has the option to purchase the plant at the end of that period. No specific agreements have been reached regarding the operation of the project after the five-year period.

THE BRC PLAN

In response to the Congressional directive, the Department of Energy explored options to secure additional private sector financing for the CRBRP. The Breeder Reactor Corporation prepared a proposal that would increase private participation in the funding of the CRBRP. It includes $1.5 billion in additional government financing and $825 million in additional private funds, the latter consisting of $675 million in short-term lending and $150 million in equity participation (see Table 1 below). This plan was endorsed by the Administration and transmitted to the Congress by the Department of Energy on August 1, 1983.

TABLE 1. PROPOSED SOURCES OF CRBRP FUNDS, 1984-1990 (In millions of dollars)

	Current Arrangements	Proposed BRC Plan	Difference
Government Appropriations	2,325	1,500	-825
Utility Contributions	175	175	---
Equity Participation	---	150	150
Private Lending	---	675	675
Total	2,500	2,500	---

1/ This is in addition to the utility contributions to date, which, with accrued interest, total $166 million.

Under the proposed plan, the federal government would be required to cover the full costs of the equity investment, as well as principal and interest payments on the debt, through various tax benefits, project revenues, and, if necessary, federal payments. Thus, the proposal embodies virtually no risks to the new private sector participants. The short-term private investment of $675 million would be retired in 1990 by the issuance (by the equity investors) of an estimated $1.04 billion in 30-year bonds, which would cover the $675 million in short-term construction loans plus interest accrued at 10 percent. The plan would require a government commitment to cover the principal and interest payments on the bonds, either from the reactor's power sales or, if those are not adequate, from other government funds. The sale of $150 million in equity shares in the project would be attracted through a guarantee of tax benefits and a share of revenue not needed to pay interest on the debt. Because of the uncertainties associated with the newness of the technology, licensing requirements, and the volume and price of future electricity sales, the BRC proposes that the government guarantee that both the equity and the debt holders will be repaid their investments, as well as a minimum rate of return. The actual rates of return would be open to negotiation and would reflect market conditions at the time. All cost overruns would be paid for in full by the federal government.

THE ALTERNATIVE: GOVERNMENT FINANCING

For the purpose of this analysis, the BRC plan is compared to an alternative that assumes:

- Federal funding of an additional $2.3 billion in construction costs;
- Utility contributions, already committed, of $175 million;
- Continued government operation of the reactor through the year 2020, with sales of power at market rates throughout the period;
- Completion of the project at the same cost and at the same time as under the BRC plan.

As with the proposed BRC plan, this alternative (which we will generally refer to as the "government-financed" plan) would require a change in the current contractual agreements, because of the present requirement that the TVA must buy the power produced by the CRBRP for the first five years at avoided energy costs. 2/ This restriction could, at the discretion of the Congress, be maintained or removed regardless of which financing plan is selected. Therefore, in analyzing the two basic alternatives, power sales at market rates were assumed for both.

The analysis also assumes that TVA would not exercise its option to purchase the reactor after five years of operation. In view of TVA's recent reductions in its own plans for construction of power-generation facilities, all indications are that TVA would probably not acquire the plant.

ESTIMATED BUDGET IMPACT OF THE BRC PLAN

CBO has analyzed the budgetary impact of the proposed BRC plan on both outlays and tax revenues, assuming that the project is completed within current cost estimates and on schedule, and that the financing terms would be those assumed by the developers of the plan.

Compared to the government-financed plan described above, the BRC plan would:

- Reduce federal outlays for project construction;
- Reduce federal tax revenues in the early years (through 1995), and increase them in subsequent years; and
- Reduce or eliminate federal receipts from the sale of power.

Each of these effects is discussed separately below.

Construction Outlays

Under the BRC plan, the government would spend $1.5 billion and private parties $1.0 billion to complete the CRBRP. This would reduce federal outlays by $825 million between 1984 and 1990--with $150 million provided by equity investors and $675 million covered by short-term construction loans.

2/ Avoided energy cost is the incremental cost to an electrical utility of electric energy or capacity or both.

Tax Revenues

The equity participants, in return for their investment, would be entitled to potentially large tax credits and deductions. The proposal does not assume any new tax benefits; it only requests that the federal government guarantee to make appropriate repayments to the equity investors if the current tax incentives are not made available as planned. On this basis, the equity investors would be entitled to the 10 percent investment tax credit on the $825 million of private investment, depreciation on 95 percent of the investment using the accelerated cost recovery system (ACRS), and deductions of construction interest costs. 3/ Offsetting these tax losses would be the revenue generated by taxes on the bond interest and on power revenues received by the equity investors.

The Investment Tax Credit. The equity holders would be entitled to take the 10 percent investment tax credit (ITC) on the full amount of the private investment ($825 million), as progress payments were made on the CRBRP. Over the 1984-1990 period, the cost of these credits to the U.S. Treasury would be $82.5 million.

Accelerated Depreciation. The equity participants would be allowed to take depreciation under the accelerated cost recovery system. Because the proposal requests that the project be exempted from the rules regarding public utilities, it is assumed that that property would be depreciated over five years. (If the property was classified as public utility property, it would be depreciated over ten years.) The investors would be allowed depreciation deductions based on only 95 percent of the cost of the project. They could not depreciate 100 percent of their investment because of the 50 percent basis adjustment for the ITC required by the Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA).

3/ In general, the deductions and credits from the CRBRP would exceed the anticipated income from the project during the construction phase and its first few years of operation. Because of this, the BRC plan has been designed as a partnership so that the investment tax credit (ITC) and the deductions for depreciation and construction interest could be used to reduce the investors' outside taxable incomes. The partnership arrangement outlined by the BRC would allow the full tax deductions to be passed through to the equity investors. Because of the "at-risk" rules in the tax code, it is expected that virtually all of the equity participants would be corporations. The at-risk rules limit an individual's tax loss in any given investment to the amount the investor stands to lose in the venture. These rules do not apply to corporate investors.

For the purposes of this analysis, it is assumed that the equity investors would be corporations subject to a marginal tax rate of 46 percent. The private investors would not be allowed to start taking depreciation until 1991, when the plant was placed into service. The revenue loss to the government from these deductions would be an estimated $361 million, occurring over the 1991-1995 period. (If the property was classified as public utility property, the revenue loss would be the same but would be spread out from 1991 through 2000.)

Construction Interest. It is assumed that the investors would be allowed to deduct interest expended during the construction period (1984-1990), estimated to total $365 million. Although the interest would be deductible by the equity holders, it would constitute taxable income to the lenders. The net cost of this provision to the government would be the differential in tax rates between the equity investors and the lenders. In this analysis, it is assumed that the equity investors would be in the 46 percent tax bracket and the lenders in the 25 percent tax bracket. [4] This difference in tax rates would result in a net cost to the government of $77 million over the 1984-1990 period. If the borrowers and lenders were assumed to be in the same tax bracket, this provision would not result in a net cost to the Treasury.

Although it is assumed that the equity holders would be allowed to expense interest during the construction phase of the project, they might be required by the Internal Revenue Service (IRS) to "capitalize" the interest payments. [5] TEFRA requires firms to capitalize interest payments related to nonresidential real property. Although ten-year public utility or five-

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4/ The tax rate on the equity holders is higher than the assumed rate on the bondholders because the equity participants will primarily be corporations (which have a marginal rate of 46 percent). The bond interest recipients are assumed to be individual taxpayers. The average marginal tax rate for individuals receiving interest income is approximately 25 percent (see U.S. Department of the Treasury, Internal Revenue Service, Statistics of Income--1979, Individual Income Tax Returns, 1982).

5/ Capitalized interest payments would not be deductible when expended but would be added to the basis of the property and recovered through depreciation. That is, the value of the property would increase by the amount of construction interest and would therefore increase the annual depreciation deduction proportionately. In addition, the capitalized interest payments would be eligible for the 10 percent ITC during the year in which they were incurred.

year recovery property is not considered in the class of nonresidential real property for depreciation, part of the CRBRP could be considered real property for purposes of the interest capitalization provision. The effect of capitalizing the interest payments is discussed later in this analysis.

Bond Interest and Power Sales. Offsetting the cost of the tax benefits allowed the private parties are the additional tax revenues associated with the project. The proposal estimates that the CRBRP would generate sufficient power sales to pay both the interest (at 10 percent) and the principal on the $1.04 billion of long-term debt. On an annual basis, the revenue required to pay off the bonds would be $110 million. For purposes of this analysis, it is assumed that the investors receive $110 million per year composed of net income, after operating expenses, from power sales or government appropriations. 6/ (If net sales income is less that $110 million, the government is assumed to cover the shortfall.) In the event that net income exceeds $110 million, it is assumed that the difference is turned over to the Treasury. (Although the plan is unclear as to how the revenues over $110 million would be shared, the assumption used here is conservative in that any residual revenue allocated to the private parties increases the net cost to the government of the BRC option.) Under these assumptions, the $110 million in annual net income is therefore not affected by the actual prices and costs of power over the life of the CRBRP.

It is assumed that the full $110 million per year received by the equity investors is used to pay off the long-term bonds. Because only the interest portion of the bond repayments constitutes a deduction for tax purposes, the equity investors would owe tax on the difference between the $110 million in revenue and the bond interest expense. Because the interest payments are also taxable income to the recipients, the full $110 million would be subject to taxation--partly to the equity investors and partly to the bondholders. The total additional tax revenue is estimated to be $29 million in 1991, increasing gradually to $49 million in 2020. 7/

6/ This is the assumption in the BRC proposal of 350 megawatts of capacity, utilized at 65 percent, and sold for 11 cents per kilowatt hour. Operating expenses are assumed to be 5.5 cents per kilowatt hour, yielding net sales income of 5.5 cents per kilowatt hour.

7/ The tax revenue grows from $29 million to $49 million because the bondholders are in a lower tax bracket (25 percent) than are the equity holders (46 percent). Because the bonds are assumed to be fully amortized over 30 years (structured like a mortgage), the percentage of the $110 million paid in interest declines over the life of the loan. Therefore, the share of the $110 million subject to the lower 25 percent tax rates falls, and the share subject to the 46 percent rate rises, over the 1991-2020 period.

Federal Receipts from the Sale of Power

While under the BRC plan revenues from power sales would accrue to the equity holders, such revenues would be paid to the Treasury under the government-financed plan. These receipts, net of operating costs, would be $110 million per year over the project's 30-year life, under the assumptions of this analysis. 8/

The cash flows to the federal government for the two basic alternatives are summarized in Table 2.

In the short run (1984-1990), the private financing plan would save the federal government $825 million in construction outlays. These savings would be partially offset by tax losses of $159 million ($82 million in ITC and $77 million net interest during construction). As a result, the net saving to the government in the short run would be an estimated $666 million.

Between 1990 and 2021, however, the government would relinquish $3.3 billion in potential power sales. In addition, the private parties would be entitled to ACRS deductions worth $361 million. Offsetting these costs would be tax revenues (from the bond and equity holders) in the amount of $1.05 billion. Thus, the private plan would add $2.6 billion more to the federal deficit than the government-financed case over the 1990-2021 period. 9/

8/ More generally, power sales are assumed to be equal in both the BRC and the government-financed cases. Under the BRC plan, if net income from sales is less than $110 million, the government must appropriate the difference to pay off the bondholders; in the government-financed case, it forgoes the same amount of power revenue. In other words, the incremental cost to the government of net sales income less than $110 million is identical in both cases. Because the government is assumed to retain 100 percent of the revenues in excess of $110 million, the marginal revenue from an increase in sales is the same for both cases. Because of this symmetry, the difference in net costs of the two plans does not vary if net power income differs from the assumed $110 million.

9/ These estimates do not include changes in interest on the public debt that would result from the two alternatives. Such interest costs are reflected in the present value analysis discussed in the following section.

TABLE 2. COMPARISON OF THE BRC PLAN AND THE GOVERNMENT-FINANCED PLAN (In billions of dollars)

	BRC Plan		Government-Financed Plan	
	1984-1990	1991-2020	1984-1990	1991-2020
Construction Outlays	1.5	---	2.3	---
Tax Losses				
ITC	0.1	---	---	---
ACRS	---	0.4	---	---
Interest deductions (net)	0.1	---	---	---
Less: Tax Revenue	---	-1.1	---	---
Less: Power Sales Income	---	---	---	-3.3
Total Increase or Decrease (-) in the Deficit	1.7	-0.7	2.3	-3.3

NOTE: The amounts in this table represent current cash flows, not discounted present values.

PRESENT VALUE ANALYSIS

Because the value to the government of receiving a dollar ten years from now is different (and less) than the value of receiving the same dollar today, it is useful to discount future outlays and revenues so that the alternatives can be more accurately compared. Discounting all future dollar amounts puts all cash flows on a commensurate basis, regardless of the year in which they occur. The total of all discounted future cash flows is the discounted present value of a project, and it reflects the current value of all dollar amounts. The discount factor used in this analysis is 6.75 percent, which represents the estimated after-tax cost of federal borrowing consistent with the bond rate assumed by the BRC plan. 10/

10/ The pretax interest rate is assumed to be 9 percent. Bondholders are in a marginal tax bracket of 25 percent, which results in an assumed after-tax interest rate of 6.75 percent.

Under the assumptions used in this analysis, the BRC plan would cost the government almost $250 million more than if the Congress chose to fully fund the project. (More precisely, the discounted value of the private plan is $248 million less than that of the government-financed version.) This indicates that the short-term savings from the BRC plan would not offset the higher costs to the government over the life of the plant.

The higher cost of the private plan reflects the fact that, under the BRC plan, the government is essentially borrowing funds from the private sector and paying a guaranteed rate of return higher than normal government borrowing costs. 11/ Under the private plan, the after-tax rate of return earned by the equity investors is about 37 percent; the rate of return for the bondholders is 7.5 percent. The difference between these rates and the government's after-tax discount rate (6.75 percent) accounts for the higher long-term cost to the government of the BRC plan.

SENSITIVITY ANALYSIS

The results of the above analysis do not change greatly even when the major assumptions are modified. Under varying assumptions, the private plan generally costs the government more than government financing, although the differences may be less than the $248 million (in present value terms) of the basic case described above.

Six alternative cases were analyzed to study the effect that modified assumptions would have on the present value of the BRC plan, as compared to the government-financed plan. They are as follows:

(1) Ten-Year Public Utility Property

Instead of depreciating the CRBRP over five years, it is assumed that the property is defined as ten-year public utility property. If all other assumptions are held constant, this change reduces the present value of the depreciation deductions and thereby reduces the cost to the government of the BRC plan by an estimated $24 million. The cost of the private plan, on a present value basis, would still exceed that of the government-financed version by $224 million.

11/ This is essentially the same conclusion reached by the General Accounting Office in its "Analysis of Studies on Alternative Financing for the Clinch River Breeder Reactor" (GAO/RCED-83-151), May 12, 1983.

(2) Construction Interest Capitalized

In the base case, it was assumed that construction interest was expensed. Alternatively, it can be assumed that the construction interest must be capitalized and recovered through depreciation. 12/ (It is likely that the actual tax treatment of the construction interest would fall somewhere between full capitalization and expensing.) Since the capitalization of interest payments would delay the realization of some of the tax benefits to the investors, this assumption would reduce the cost to the government of the BRC plan by an estimated $12 million on a present value basis. The cost of the private plan would still exceed that of the government-financed alternative by about $236 million.

(3) Equal Public and Private Borrowing Rates

The basic analysis assumed that the government's discount rate was 6.75 percent--based on a 9 percent borrowing rate and a 25 percent marginal tax rate. It can be argued, however, that the 1 percent interest difference (between 10 percent and 9 percent) should not be counted as an advantage of the government-financed case because it does not reflect the "true" cost of capital. Because the government is removing funds from the private sector that have an assumed marginal cost of 10 percent, the government's discount rate should reflect the alternative private cost of capital. If the discount rate is raised from 6.75 percent to 7.5 percent, the relative cost of the private plan is reduced, but remains $168 million above the government-financed alternative. 13/ (This difference reflects the return above 7.5 percent provided to the equity investors.)

(4) Combined Assumptions

If the assumptions in the three foregoing cases are combined--that is, the property is depreciated over ten years, all interest is capitalized, and

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12/ Capitalized interest payments are also allowed the investment tax credit when they are incurred.

13/ If the general level of interest rates varies from those assumed in the BRC plan, both the returns required by the investors and the appropriate discount rate would change. Such variations would not significantly affect the results of the analysis.

the discount rate is 7.5 percent instead of 6.75 percent--the cost to the government of proceeding with the private financing plan would be reduced, but would still be about $117 million above the cost of government financing.

(5) Power Sales to TVA

Under current contractual agreements, CRBRP power must be sold to the TVA for the first five years. If this requirement is maintained, power revenues would be substantially lower than if power was sold to private utilities. This case compares the government-financed option, assuming power sales to TVA, with the BRC plan, assuming sales to other utilities. It is assumed that the power is sold to TVA at cost--that is, the net cash inflow over the first five years is zero. After five years, net income from power sales is assumed to revert to the $110 million per year level. For this analysis the reduction in power sales is applied only to the government-financed case; in the private plan, net income is assumed to remain $110 million for all years. By sharply reducing federal receipts under the government-financed plan, this assumption would significantly increase the attractiveness of the private plan, to the extent that its long-term cost to the government would be $59 million less than the cost of the government-financed plan. However, just as the Congress, under the BRC plan, could terminate the obligation to sell CRBRP power to TVA, it could presumably take the same action under government financing.

(6) Reduced Power Sales

This case combines the five-year TVA assumption from case (5) above with an assumption of reduced power sales under the private plan in the first five years. In this case, it is assumed that private power sales are only 75 percent of $110 million (or $82.5 million) in the first five years. This could occur if the plant operated at a low capacity or prices were lower than anticipated. In this case, the government would have to appropriate $27.5 million per year in order to cover the repayments of the private bonds. Compared to case (5), the assumption of reduced private power sales increases the cost of the BRC plan because of this appropriation. If all other base case assumptions are held constant, the difference in discounted present value between the two financing alternatives is only $17 million.

The results from these sensitivity cases are summarized in Table 3. Both the government's discounted present value and the equity holders' rate of return are presented for each case. The differential cost to the government of the two financing alternatives is also shown. In all but one case, the cost of the BRC plan exceeds that of the government-financed option. Only case (5) has the opposite result, and that requires an assumption that power would be sold to TVA for the first five years, at below-market rates, only under the government-financed plan. Thus, if the Congress chooses to sell electrical power at below the private market price, the public plan may be the more costly alternative. On the other hand, if the Congress decides to sell the CRBRP power at private market prices, the public plan will be the less costly alternative. In sum, as long as the CRBRP power is sold at the same price under either the private or the public plan, the private plan will be the more costly alternative. The relative discounted cost of the private plan as against the public plan ranges from $117 million to $248 million under the alternative cases shown here.

It should be noted that the assumption that all residual revenues from the project accrue to the federal government minimizes the cost of the private plan. If a share of the annual net income (over the $110 million needed to pay off the bonds) was dedicated to the equity holders, the comparative cost of the private plan would be greater than shown in each of the cases. Therefore, depending on the revenue sharing agreement, the net cost to the government of the private plan could be higher than indicated here.

Finally, if annual net income from power sales fell below $110 million, the costs of both the plans would rise by the same amount, because the government would bear the cost in either event. Thus, the relative costs of the two alternatives do not change if power income is less than $110 million a year. 14/

14/ Again, this assumes that the actual power sales would be the same in both alternatives, even though the amount would be less than $110 million a year.

TABLE 3. SENSITIVITY ANALYSIS OF THE COST OF THE CRBRP (In millions of dollars)

	Discounted Present Value			
Case a/	Government-Financed Plan	BRC Plan	Difference b/	Equity Holders' After-Tax Rate of Return
(1) Ten-Year Depreciation	-1,105	-1,329	224	33.5
(2) Capitalized Construction Interest	-1,105	-1,341	236	27.2
(3) 7.5 Percent Government Discount Rate	-1,184	-1,352	168	36.8
(4) Joint Assumptions 1, 2, and 3	-1,184	-1,302	117	22.5
(5) Five-Year Sales to TVA	-1,413	-1,353	-59	36.8
(6) Reduced Power Sales and Five-Year Sales to TVA	-1,413	-1,430	17	36.8
Initial Base Case	-1,105	-1,353	248	36.8

a/ For further explanation of the cases see text.

b/ The difference represents the comparative discounted cost of the private plan versus government financing. A positive difference indicates the private plan costs more than the public plan, and vice versa.

The CHAIRMAN. Thank you very much.
Mr. Peach.

STATEMENT OF J. DEXTER PEACH, DIRECTOR, RESOURCE, COMMUNITY AND ECONOMIC DEVELOPMENT DIVISION, GENERAL ACCOUNTING OFFICE

Mr. PEACH. Mr. Chairman, if you would place my full statement in the record I will try to briefly summarize the essential points.

Since March 1983 we've been reviewing issues related to how increased private financing could be provided for the Clinch River breeder reactor. I might add GAO has been reviewing issues related to Clinch River breeder reactor since the early 1970's when I first became involved with GAO's energy work.

We have reported on the financing framework which DOE presented in March 1983, and the most recent financing plan which DOE transmitted to the Congress in August 1983. DOE and BRC concluded that with the appropriate Government guarantees, the CRBR project should be able to attract an additional $825 million in new construction financing; $675 million would result from the sale of bonds and $150 million would be raised from the sale of equity shares. An additional $175 million would be the remainder of the contributions, including any interest earned on the contributions while held in escrow, pledged by electric utilities at the outset of the project.

Also, the equity investors may be assigned to share in excess profits resulting from the sale of CRBR generated electricity.

Our overall assessment of the DOE and BRC approach is that private financing represents a tradeoff between short term budgetary savings and possible higher overall Government costs for the project. It should be kept in mind that with the possible exception of the funds already committed by the private utilities, the Government would maintain all project risk with private financing just as it does in the Government financing.

The Government initially assumed this risk because the CRBR was a demonstration project representing one further step in a long-term research and development process that is intended to make breeder reactors available as a future source of electricity. As an R&D project, the future of the breeder program in general, and CRBR in particular, rests on a broad range of issues. Among these issues are CRBR's role in breeder R&D, project costs and related budget impacts, the need for and the timing of commercial breeder reactors, the projected availability of uranium ore for the current generation of light water reactors, and the projected demand for electricity and nuclear power's role in meeting that demand.

I should emphasize that GAO takes no policy position on building the CRBR. Rather we believe decisions about its future requires a combination of economic, value, and political judgement by the Congress against the backdrop of a wide range of issues. We hope our testimony today can add to your understanding of those issues.

[The prepared statement of Mr. Peach follows:]

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

FOR RELEASE ON DELIVERY
Expected at 2:00 P.M.
Thursday, September 22, 1983

STATEMENT OF
J. DEXTER PEACH
DIRECTOR
RESOURCE, COMMUNITY AND ECONOMIC DEVELOPMENT DIVISION
BEFORE THE
SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES
ON
PRIVATE FINANCING FOR THE CLINCH RIVER BREEDER REACTOR

Mr. Chairman and Members of the Committee:

We welcome the opportunity to discuss the proposed private financing for the Clinch River Breeder Reactor (CRBR). During the past few months, we have issued two reports on the Department of Energy's (DOE's) efforts to obtain additional private financing for the CRBR project.[1]

In March 1983, DOE and a task force of the Breeder Reactor Corporation (BRC)--a company representing utilities who have contributed funds to the CRBR project--issued reports that described a potential framework for obtaining private financing for the CRBR. On May 12, 1983, we reported, that they

--represented the beginning of a process that would require much more work before a detailed private financing proposal is developed,

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[1] Analysis of Studies on Alternative Financing for the Clinch River Breeder Reactor" (GAO/RCED-83-151, May 12, 1983) and "Comments on a Plan for Obtaining Private Financing for the Clinch River Breeder Reactor" (GAO/RCED-83-226, Aug. 22, 1983).

- --represented a trade-off between short-term budgetary savings against possible higher overall Government costs for the project, and
- --provided insufficient information to adequately analyze the tax benefits associated with attracting private financing.

On August 1, 1983, DOE submitted to the Congress a more definitive financing plan which was also prepared by the BRC task force. We reviewed this plan and provided you with our comments on August 22, 1983.

OVERVIEW COMMENTS ON FINANCING PLAN

The August plan provides more information on project organization, debt financing, equity financing, and tax benefits. However, the basic concepts remain the same--that with Government guarantees, the revenues from CRBR-generated electricity, and available tax benefits, investors could be found to finance a portion of the remaining CRBR cost. The private sector financing would produce budgetary savings during the CRBR's construction. But, such savings would be a trade-off against either future reductions in Federal revenues or additional budget outlays. Specifically, the revenues expected to be produced from the sale of CRBR-generated electricity will be used to pay back private investors. If, however, the revenue is inadequate, the plan calls for the Federal Government to provide funds necessary for operating expenses and repayment of the private investment.

The latest plan calls for the project to be a joint venture comprised of the Federal Government and a partnership of private investors. The Secretary of Energy--following enactment of appropriate legislative authorization--would transfer title of the CRBR powerplant to the joint venture. The Government and the private investors would own the project in proportion to their respective investments.

About $1.66 billion have already been spent on the CRBR project. DOE currently estimates that an additional $2.5 billion will be required to complete the project. The BRC task force plan calls for the joint venture to raise about $1 billion toward that remaining cost. About $675 million of the $1 billion would be provided from debt (loans and bonds) financing while about $150 million would be raised by selling equity shares in CRBR. The remaining $175 million would be the remainder of the contributions, including any interest earned on the contributions while held in escrow, pledged by electric utilities at the outset of the project.

DEBT FINANCING

The plan states that the initial private sector debt financing would be provided from $675 million in short-term (1984 through 1990), 10-percent construction loans. BRC task force officials believe these loans will be available from several large private lenders. The construction loans (including interest) would then be retired by having the joint venture issue 30-year bonds in 1990. BRC task force officials estimate that the bonds would carry a 10-percent interest rate and would be underwritten by investment bankers. The 30-year bonds would be retired using revenues from the sale of CRBR electricity. The plan states that interest paid to the bondholders would be taxable.

BRC task force and investment banking officials point out that the 10-percent interest rate anticipated for the construction loans and the 30-year bonds is only an estimate. The actual interest rate paid will reflect market conditions at the time of issuance. BRC task force officials have stated that if market interest rates are higher than 10 percent, a share of CRBR power sale revenues may be offered to investors to maintain the 10 percent rate.

EQUITY FINANCING

The BRC task force also anticipates raising $150 million by selling equity (partnership) shares in the CRBR. Shares will be sold by the investment bankers, although the plan does not specify who might purchase the shares. The return to the equity investors will be in the form of tax benefits and a share of the CRBR revenues available after the bondholders and operating expenses are paid. Task force officials stated that the distribution of such revenues will be made in accordance with a ratio that will be determined when the shares are sold.

TAX BENEFITS

Tax benefits for the equity participants are better defined in the task force's new plan than in the March 1983 reports. The new plan specifies that the participants will receive only those tax benefits available to investors in any similar private project. The plan states that the equity participants will be entitled to investment tax credits and tax deductions for accelerated depreciation; research and development expenses; and deductible costs, such as the interest paid by the joint venture on the loans. The equity shareholders' tax benefits would be based on the total private investment--both debt and equity investment combined--not on the equity share alone. That is, for an equity investment of $150 million, the investors would receive tax benefits on the total new private investment of $825 million (the $1 billion private investment minus the remainder of the utilities' pledged but unpaid contributions). Because the investors and their respective tax obligations are currently unknown, the net effect of private investment in the CRBR on Federal tax revenues is uncertain at this time.

UTILITY CONTRIBUTIONS

The plan also considers $175 million in utility contributions to be part of the $1 billion private investment package. This is not, however, a new contribution but the remaining undelivered portion of the utilities' original $257 million pledge plus the interest utilities' contributions have or will earn while in escrow.

GOVERNMENT FINANCING

The plan envisions that all costs to complete the project over and above the $1 billion private investment (DOE estimates these to be $1.5 billion) will be paid by the Federal Government. Thus, the private financing plan would require the Congress to enact a $1.5 billion appropriation, with obligations to be made over the next 7 or more years as needed for plant construction. In the event of cost overruns, construction schedule delays, operating problems, or insufficient electric power sale revenues, the plan calls for the Federal Government to provide all additional funds.

GOVERNMENT GUARANTEES AND RISKS

The plan also calls for the Federal Government to guarantee that the equity investors' tax benefits associated with the CRBR will be realized and that, if CRBR is not completed, licensed, or operated as planned, the equity investors and bondholders will be repaid--both their investment and a rate of return on their investment to be agreed upon during future negotiations. Thus, the March reports and the more recent plan emphasize that private financing can only be obtained if the Federal Government retains all project risks by guaranteeing that the Federal funding will be provided when needed, the CRBR will be built and licensed on schedule, and it will operate and produce revenues as projected.

Before concluding my statement one basic point must be made. Over the past few years, we have issued numerous reports dealing with various aspects of the breeder reactor research and development program and more specifically with the CRBR. We have consistently pointed out that the breeder program is a research and development program and that construction of a demonstration plant such as the CRBR or a similar demonstration project is a logical step in the research and development process.

In that context, discussion concerning the future of the breeder program in general and CRBR in particular rests on a broad range of issues. Among those issues are CRBR's role in breeder reactor research and development, project costs and related budget implications, the need for and timing to bring breeder reactors on-line, the projected availability of uranium ore to fuel the current generation of light water reactors, and projected demand for electricity and nuclear power's role in meeting that demand. Thus, decisions about the future of the CRBR ultimately require economic, value, and political judgments by the Congress against the backdrop of a wide range of issues.

This concludes my prepared statement. We will be glad to answer any questions.

The CHAIRMAN. Thank you very much.

Mr. Kaufman.

STATEMENT OF ALVIN KAUFMAN, SENIOR SPECIALIST IN MINERAL AND REGULATORY ECONOMICS, CONGRESSIONAL RESEARCH SERVICE, LIBRARY OF CONGRESS

Mr. KAUFMAN. I will summarize.

My comments are restricted to the issue of the sale of electricity from Clinch River. They are restricted to the issue of revenues from the sale of electricity from the Clinch River breeder reactor project.

The task force expects to sell 2 billion kilowatt-hours per year at an 11 cent per kilowatt-hour price. Production of 2 billion kilowatt-hours assumes a capacity factor of 65 percent after the initial shakedown period. Given the experimental nature of that breeder, a lower capacity factor would appear profitable.

In any case, as the plants get older its availability may well decline. Given the small size of the plant it is probable that its output could be absorbed by the region assuming the cost of the energy was competitive.

Current utility planning indicates there will be no need for the plant, but there is always slippage, and in any case someone in the region could always use a small unit such as 350 megawatts. So while there is no need for the CRB, its output can be sold.

Insofar as the price is concerned, the task force assumed this will be based on avoided cost. This may not be permitted by State regulatory bodies. If avoided cost is used and the energy is sold to TVA, it would probably be at the running cost of existing marginal plant which is estimated at approximately 7.5 cents per kilowatt-hour in 1995. If sold elsewhere it would probably be at the full cost of a new coal plant.

Estimating future prices is always hazardous but we would estimate that at 6 to 8 cents per kilowatt-hour in 1992 which would be roughly 7 to 10 cents in 1995 dollars. We would thus conclude that the task force estimates may be optimistic.

My comments in regard to the breeder may appear somewhat negative, but this is to be expected when one considers the revenues of a project on the edge of technology in terms of a commercial enterprise. As an experimental technology the breeder has from its inception purposes, and been subject to, criteria different from standard commercial power ventures. These different criteria are not addressed in this assessment of revenue assumptions.

That concludes my statement.

[The prepared statement of Mr. Kaufman follows:]

STATEMENT OF ALVIN KAUFMAN, SENIOR SPECIALIST IN MINERAL AND REGULATORY ECONOMICS, CONGRESSIONAL RESEARCH SERVICE, LIBRARY OF CONGRESS

Mr. Chairman:

In response to your invitation, I have prepared the subsequent material. In doing so, I have restricted my comments to the issue of revenues from the sale of electricity from the Clinch River Breeder Reactor Project (CRBRP). In doing so, I am not addressing any other aspect of the CRBRP Task Force Report, nor am I addressing the question of whether or not the breeder should be built.

The task force expects the revenues available from power sales to be adequate to cover all costs including debt service and other capital obligations. This assumes sales of 2 billion Kwh (B Kwh) per year based on a 65 percent capacity factor, at an 11¢/kwh price. In our discussion, we will deal with the questions of output and price separately.

Electricity Output

The issue of electricity output can be viewed in two parts: 1. the ability to sell what is produced, and; 2. the ability to produce 2 B Kwh.

The ability to produce 2 B Kwh annually is based on an assumed annual capacity factor (CF) of 65 percent. 1/ It is expected that there will be an initial shakedown period (1990-1993) during which the plant will operate at a CF ranging between 12 and 63 percent. Starting in 1994, the plant is expected to run at a CF of 65 percent through 2019. In its report, the task force notes that the capacity factor may prove to be lower than 65 percent in view of the prototype nature of the project. In my opinion, given the experimental

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1/ Output (Kwh) = CF x Capacity (Kw) x hrs.

nature of the breeder, a lower capacity factor seems probable. Even if the Clinch River facility were not experimental, however, it is unlikely that the plant would operate at 65 percent over a 25 year period. The 65 percent is a good average during the earlier years, but as the plant gets older, its availability presumably will decline. Thus, in the later years output may be less than the 2 B Kwh projected. For example, if the capacity factor dropped to 55 percent, output would only aggregate 1.7 B Kwh, with a consequent reduction in revenues.

Therefore, I would conclude that there is a strong probability that the CRBR will not be able to produce an average of 2 B Kwh annually over its life.

Insofar as the ability to sell the energy produced is concerned, given the relatively small size of the plant (350 MW), and its relatively distant start-up date, it is probable that its output could be absorbed by the region, assuming the cost of this energy was competitive. The projected 2 B Kwh is only 0.3 percent of estimated 1992 regional generation.

The Southeastern Electric Reliability Council (SERC) anticipates that 663 B Kwh will be required in the region in 1992, with an estimated peak of 119,331 MW. The resources planned to meet this demand are estimated at 152,782 MW. Planned resources are defined as installed capacity in being, under construction or planned, plus net purchases, and minus deactivated capacity. The resources planned for 1992 represent a 22 percent increase over the 124,991 MW available in 1983. 2/

If these resources are on line by 1992, the reserve margin would be 28 percent. Assuming a reserve margin in the 20 to 25 percent range to be adequate to assure the reliability of the system, it is apparent that current utility

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2/ North American Electric Reliability Council. Electric Power Supply and Demand 1983-1992. July 1983. pp. 180.

planning will provide more than enough capacity to meet demand. It is likely that by 1995, with virtually no additional construction, reserve margin would be 25 percent. This is based on a CRS middle case estimate of a peak demand of 122 thousand MW in 1995. 3/

Within the TVA area itself, it is unlikely that the plant output could be used. TVA is obligated to buy all of the CRBRP output during a five year demonstration period, and to provide plant energy requirements during those periods when the plant is not operating. The Authority also has an exclusive option to buy the plant, but in a recent statement the General Manager expressed doubt that TVA would exercise its option. 4/ It was further stated that under the high forecast, the earliest TVA would need additional capacity would be 1994; under the low forecast additional capacity might not be needed until well after 2000. On this basis, TVA was in no position to buy some or all of the CRBRP capacity.

Alternatively, if we assume completion of plants under construction, plus construction of new plant that has gone through the regulatory process, or is in the process, as well as retirement of all plant over 30 years old by the year 2000, there would be a shortfall in that year of 49,000 MW, including a reserve for reliability. Of this, 30,000 MW could be saved through conservation, load management, and passive solar. These demand reductions would also result in savings in generating reserve requirements of approximately 6,000 MW. In addition, approximately 1,000 MW might be provided by capacity enhancing

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3/ Congressional Research Service. An Assessment of the Need for New Electric Capacity. Library of Congress. In Press.

4/ Statement of W.F. Willis, General Manager, TVA. TVA and the Clinch River Breeder Reactor Project. Hearing before the Subcommittee on Regional and Community Development of the Committee on Environment and Public Works, U.S. Senate, April 20, 1983, Senate Hearing 98-193, p. 8-9.

measures such as cogeneration, wind, etc. Thus, an additional 12,000 MW would be required by the year 2000. This could be provided by additional capacity including the CRBR, a slower rate of unit retirements, stronger interties, possibly additional coal conversions, etc. 5/

I would conclude from the above that annual CRBR output may be less than estimated by the task force, and that while there is no need for its output, breeder production could be sold.

Electricity Price

The task force is operating on the assumption that it will receive avoided cost for its output. This is possible, but some regulatory bodies may object to such payments and insist on some other pricing concept.

Assuming that avoided cost is the basis on which the price for CRBRP output is based, it may be useful to discuss the concept. Avoided cost is generally considered to be the incremental cost saved by the buyer as a result of not having to operate its marginal unit or units. The computation of avoided cost will vary from jurisdiction to jurisdiction. Beyond this variability, it can generally be taken that avoided cost is dependent on circumstances. That is, where the producing plant will not supply firm energy, avoided cost is often taken as the running cost (fuel plus O&M) the buyer saves. This occurs because the buyer already owns capacity and is only avoiding his variable costs by the purchase. If the energy available is firm, then avoided cost can be taken as the cost avoided by not building a new plant (capacity plus running costs).

5/ Congressional Research Service for the Subcommittee on Energy Conservation and Power. A Perspective on Electric Utility Capacity Planning. House Committee on Energy and Commerce. August 1983, p. 40-41.

The task force believes the CRBRP will operate as a supplier of firm energy. The contract with TVA, however, is based on TVA running costs. These are currently estimated to be between 4¢ and 4.5¢/Kwh in 1990 rising to between 6¢ to 7.5¢ in 1995. Given that TVA has no need for the CRBRP capacity, it is unlikely that capacity charges would be included during this period.

The task force estimates that the 11¢/Kwh price will be less than the average avoided energy costs in the SERC region by 1997, and less than regional peak energy costs by 1993. Total avoided costs (including capacity charges) were estimated in the 14 to 15¢/Kwh range. We are uncertain as to whether these are levelized costs, and whether these are nominal dollars.

There are a large number of cost estimates for new plant. These vary not only in assumptions, but as to the base year or kind of dollars in which these are expressed (1982, 1980, etc.). CRS recently prepared an estimate of new plant costs in the SERC region. It was estimated energy from a new coal plant coming online in 1990 would cost between 3¢ and 4¢ per Kwh on a levelized basis, expressed in 1980 dollars. 6/ Approximately one-third of the cost would represent capacity charges. Assuming inflation at six percent per year, the cost in 1992 dollars, would range between 6¢ and 8¢ per Kwh.

The levelized cost of operating an existing oil-fired plant is estimated in the CRS study at 6¢ to 12¢/Kwh in 1992 dollars, depending on fuel price assumptions. No capacity cost is included in this estimate.

6/ Parker, Larry B. Replacing Utility Capacity: Impact of Uncertainty. Chapter in Economic Obsolescence and Electric Generating Plant. CRS for House Committee on Science and Technology, Report 83-136S, June 1983, p. 40.

Conclusion

From the foregoing, and recognizing that forecasting is at best a hazardous business, it would seem that the task force revenue estimates may be on the optimistic side. My comments this morning in regard to the CRBRP may appear somewhat negative. This is to be expected when one considers the revenues of a project on the edge of technology in terms of a commercial enterprise. As an experimental technology, the CRBRP has from its inception had purposes and been subject to criteria differing from standard commercial power ventures. These different criteria are not addressed in this assessment of revenue assumptions.

The **Chairman**. When you're looking at marginal costs, what are you referring to? Are you talking about average costs, are you talking about avoided costs? What is the definition of the term?

Mr. **Kaufman**. We're talking here about avoided cost.

The **Chairman**. You think avoided costs will be in the 6- to 7-percent range?

Mr. **Kaufman**. Yes, sir.

The **Chairman**. You're the most optimistic guy we've had around here in years.

Mr. **Kaufman**. It's hazardous to project prices.

The **Chairman**. What are you basing that on?

Mr. **Kaufman**. We have calculated the cost of a new coal plant coming on-line in the early 1990's.

The **Chairman**. What is your estimate of acid rain legislation impact?

Mr. **Kaufman**. About a mil.

The **Chairman**. And that's included in that estimate?

Mr. **Kaufman**. Yes, sir.

The **Chairman**. What is the cost of coal you're estimating?

Mr. **Kaufman**. We had two estimates. That's why we get the range between 6 and 8 cents. In the lower range we assume constant coal costs. In the upper range we assume the 1-percent-per-year increase in coal costs.

The **Chairman**. One-percent-per-year increase?

Mr. **Kaufman**. Yes, sir, in real terms. That's before inflation.

The **Chairman**. Are you figuring on any change in oil supply?

Mr. **Kaufman**. We had three oil scenarios that we used in this particular study. One in which we estimated oil prices increasing at 2 percent per year in real terms, one at constant oil prices, and one in which they declined at 2 percent per year in real terms.

The **Chairman**. And you think that's the outer limits of the range of probability on oil prices?

Mr. **Kaufman**. Yes, sir, in fact, I suspect the decline on oil price cases probably is not probable beyond 1900.

The **Chairman**. What's the current price?

Mr. **Kaufman**. The current price of oil? On average roughly about $28.

The **Chairman**. And $28 and then 2 percent a year in about 2018 the price would reach about $56 a barrel.

Mr. KAUFMAN. In real terms now.

The CHAIRMAN. You are some kind of an optimist. I'm sure glad we've got somebody around that is that optimistic about the future. I don't mean to belittle that, but every estimate I have seen about oil prices is higher than that.

Mr. KAUFMAN. If you look at the latest studies that have been put out by Mr. Lipger from the Petroleum Research Foundation, by Bruce Nitcher and some others, they are now projecting constant prices through 1990, and most of them in there because it gets really hairy after that.

The CHAIRMAN. I think it's hairy right next week. Have you read that Iraq has new fighter aircraft and new missiles? Are you aware of the news reports that Iraq has obtained new fighter aircraft and new sophisticated missiles?

Mr. KAUFMAN. Yes.

The CHAIRMAN. Do you believe it is possible they might use those?

Mr. KAUFMAN. Yes. The problem with forecasting fuel prices over on the long term is that next week we will have a new forecast.

The CHAIRMAN. We are trying to make policy though on the basis of an estimate we hope will be in effect longer than that.

Mr. KAUFMAN. That's why we made a range of estimates and attempted to bracket what we felt were the outer limits.

The CHAIRMAN. You think it's plus or minus on oil prices?

Mr. KAUFMAN. Yes, over the long term.

The CHAIRMAN. Mr. Penner, in preparing the existing arrangement for CRBR with the BRC's private financing plan, did you consider the present arrangement of selling power to TVA at their avoided cost as one of their study cases?

Mr. PENNER. Yes, sir, we did. If you believe that would occur, power would have to be sold at a lower price to TVA under the Government plan than under the private plan. We don't understand why that would be so, but if that is truly your belief, then the cost comparison would flip-flop and the private plan would be cheaper.

The CHAIRMAN. The private plan would be cheaper if that cost that's now mandated by policy and law would continue?

Mr. PENNER. Yes. We assume that the current arrangements would be changed.

The CHAIRMAN. Upon what do you base that assumption?

Mr. PENNER. Since you would need quite a large amount of legislation incorporating that particular provision if you were to go to private plan, we assume it would be just as easy to do that with the public plan.

The CHAIRMAN. Have you looked at the old public versus private power over the last half century, the political history of the evolution of that policy statement?

Mr. PENNER. We are looking at the substance of it. We don't make political judgments.

The CHAIRMAN. But to make a judgment based upon what the past has been, would it not be fair to say the context of that policy debate over the last half century Congress has always maintained a consistent position?

Mr. PENNER. I'm not sure, sir. I guess that would be fair. But again, what is being assumed here is that the price would go up under the private plan, and I'm not sure that would be consistent either.

The CHAIRMAN. If it was sold outside of the TVA area by a non-governmental entity, that fits one body of public policy, does it not, that's in existence today? And if it's sold by a publicly owned plant through a Federal agency like TVA, it fits another body of existing public policy, does it not?

Mr. PENNER. I think you really have to make that judgment, sir. If you really believe that the only way one can get out of that lower price is to go the private route, then the cost would flip-flop.

The CHAIRMAN. Mr. Kaufman, have you looked back at the operating history of EBR-2?

Mr. KAUFMAN. Yes.

The CHAIRMAN. What has been its availability over the last 10 years?

Mr. KAUFMAN. It came on line in roughly 1962. It's only 17 megawatts, which makes it probably a little more available than perhaps a larger unit. It's currently operating at about 65 percent capacity factor in this year, and it has been as high as well into the 1970's in some years and down well below that in others.

The CHAIRMAN. Did you hear the testimony earlier today by Secretary Brewer with respect to the availability factor of the EBR-2?

Mr. KAUFMAN. Yes, sir.

The CHAIRMAN. Do you think Secretary Brewer is in error in his statement about availability factors of the EBR-2?

Mr. KAUFMAN. No. I think it depends on what time period he is discussing.

The CHAIRMAN. Of the last 10 years.

Mr. KAUFMAN. Over the last 10 years it's been fairly efficient running, well up into the 1970's I believe during most of the time. There have been times when it has dropped below, for example, this year it's at 65 percent.

The CHAIRMAN. I might just note for the record that EBR-2 is entering its 20th year of operation, so it's not exactly a new plant. How about the newer machine FTF Panther? Are you aware of the cycle capacity factors achieved in that machine?

Mr. KAUFMAN. No. We've looked at the Phoenix in France.

The CHAIRMAN. The FFTF in cycle 1 is 50 percent availability, cycle 2 is 83 percent, and cycle 3 with 1 month left of operation in that cycle is 93 percent available. Are you aware of that?

Mr. KAUFMAN. No.

The CHAIRMAN. Are you familiar with the technology differences between LWR's and LMFBR's with respect to availability factors?

Mr. KAUFMAN. In a limited wav, yes, sir.

The CHAIRMAN. Is there a difference in their technology that affects availability?

Mr. KAUFMAN. I think so. I think the breeders, because of the type of coolant that they use, have a higher possibility of having lower capacity factors.

The CHAIRMAN. How about downtime for refueling? Is there a difference in downtime for refueling between the two technologies?

Mr. KAUFMAN. I can't answer that.

The CHAIRMAN. If, as a matter of fact, there is a difference and it favored the LMFBR's, that would affect availability also?

Mr. KAUFMAN. Yes, sir.

The CHAIRMAN. Mr. Peach, let me ask you a question with respect to a plan that has been developed and presented to us. Do you believe that the Government will certainly and absolutely have to make good on the Federal assurance requested under the plan?

Mr. PEACH. That would be my understanding. The guarantees are what are being asked for in order to get the private capital put up.

The CHAIRMAN. Do you think they will actually have to be used? There have been a lot of questions asked about who is taking the risk here.

Mr. PEACH. The question, of course, is whether the plant is up and operates as projected. The finance plan envisions this plant up and operating almost as a fully commercial plant. It does represent, I think, a plant a little different than we had envisioned over the years, where we have essentially, up to this point, looked at it as a research and development effort to determine whether or not breeder technology is something that we think we can pursue and employ in a broad basis in the country.

If it operates in a commercial fashion, and the revenue flows come in the way they think they will they would be able to retire the debt. I think the implications that need to be looked at carefully and Congress needs to look at the assumptions and trying to understand them as best they can in terms of the CBO analysis. It is a question of what the short-term budget implications are of the plan, and what, over the longer term, what the cost might be to the Government. Probably nobody knows with absolute precision how that will work out, because you are projecting things 30 years in the future, and you don't know how a lot of things are going to work and how they are going to develop.

The CHAIRMAN. As I indicated to Mr. Kaufman, I have some uncertainty in my own mind about what next week holds for us.

Mr. PEACH. The key factor that deals with this question, that has to be looked at in terms of the short-term budget impact versus the long-term impact, is the question of the Government's ability to get the money if they would go out in the market as opposed to the rates investors would have to pay for that particular money. There is always a differential there, and that would imply over a long term, a difference in cost.

The CHAIRMAN. Mr. Penner, you have analyzed two scenarios in essence, made a comparison primarily between the proposed plan that has been presented to us. You did not make the analysis against the existing arrangements.

Mr. PENNER. We did, sir. We had the numbers.

The CHAIRMAN. Which cost the Federal Government more?

Mr. PENNER. By the existing arrangements, you are back on the question as to how much the power is sold for in the first 5 years.

The CHAIRMAN. That is one of the elements.

Mr. PENNER. If you assume that the price of the power is the same in the two instances.

The CHAIRMAN. But the current arrangement isn't the price of the power being the same.

Mr. **Penner**. Right. The current arrangement has the lower price for the 5 years in it. If you assume a continuation of the current arrangement under the Government finance plan, but not under the private plan, then the Government plan costs more over the long run. If you assume that you escape from that arrangement under the Government plan——

The **Chairman**. I am not asking about changes in policy. I am asking about a comparison between the existing plan, the one that has been in effect, and the one we presumably would follow unless we change something, and the change that has been suggested before us as a package of changes. The package of changes compared to existing construction and operation, then the new plan is less costly to the Government than is the old plan or present plan; am I correct?

Mr. **Penner**. Yes, solely because of the increase in the price of power.

The **Chairman**. Do you assume under the present plan that annual appropriations are made exactly on schedule and the money is there when it is requested and needed?

Mr. **Penner**. Under the existing plan, yes, sir.

The **Chairman**. Is there any uncertainty in that?

Mr. **Penner**. I am sure there is uncertainty. I would guess there would be uncertainty involved in the private arrangements as well.

The **Chairman**. If this private arrangement calls for, and I think it does, does it not, a single Federal appropriation and the balance of the money to be arranged in the financial markets?

Mr. **Penner**. But obviously you could do that under the existing plan as well.

The **Chairman**. But the existing plan doesn't call for that, does it? It calls for annual appropriations.

Mr. **Penner**. That's right, sir. But it would obviously be better to do it the other way.

The **Chairman**. It would be obviously better to do it the other way, so part of your analysis is to suggest that we ought to give it a one-shot finance?

Mr. **Penner**. That would be desirable.

The **Chairman**. Do you have any way of putting any kind of a risk factor quotion on the likelihood of Congress voting for a one-shot on Federal financing?

Mr. **Penner**. No, sir. Everything we did assumed that the reactor went ahead as is now envisioned.

The **Chairman**. And that would assume that Congress is fully supportive and always remained fully supportive, and there is never any glitch in the progress.

Mr. **Penner**. Well, at least equally in the two cases.

The **Chairman**. Equally in the two cases in the sense well you could arrange one-shot financing on the one. The other doesn't have it, and you assume that there are equal possibilities for some failure of the two systems.

Mr. **Penner**. If in fact the Congress is willing to go along with one-shot financing in the private situation.

The **Chairman**. Then if they were equally willing to go along with one-shot financing and the public financing. That is the comparison you are making.

Mr. PENNER. Yes, or equally unwilling.

The CHAIRMAN. If they are equally unwilling, I guess all bets are off.

Mr. PENNER. Yes. You would probablv have trouble selling it.

The CHAIRMAN. Gentlemen, thank you very much for your testimony. I appreciate your patience.

We have one more panel consisting of Robert A. Georgine, represented by Mr. Dan Mudy of the AFL-CIO; Jill Lancelot, National Taxpayers Union; Fred Smith, counsel for a Competitive Economy; and John Sheehan, United Steelworkers of America. Is Mr. Sheehan here?

Mr. SMITH. No. Mr. Sheehan could not attend. We have some of his remarks for the record.

The CHAIRMAN. We will hear first from Mr. Mudy.

STATEMENT OF ROBERT A. GEORGINE, PRESIDENT, BUILDING AND CONSTRUCTION TRADES DEPARTMENT, AFL-CIO, AS PRESENTED BY DAN MUDY, LEGISLATIVE DIRECTOR

Mr. MUDY. Thank you, Mr. Chairman. Mr. Chairman and members of this committee, first of all, my name is Dan Mudy, and I am legislative director for the Building and Construction Trades Department, and I am here on behalf of President Robert Georgine who is also the chairman of the nationwide committee, which is called the Committee on Jobs, Environment, and Technology.

Before I get into the issue of Clinch River itself, let me take a moment to explain what we abbreviate the committee to. We call it CJET.

CJET is a truly unusual an unique collection of labor, business, minorities, women, scientists, and professionals.

Our membership includes 18 labor unions, the U.S. Chamber of Commerce, the General Federation of Women's Clubs, the National Conference of Black Mayors, the National Black Caucus of State Legislators, the National Association of Manufacturers, and a range of other organizations prepresenting all walks of life.

A coalition of this diversity is rare and the areas of disagreement can be many.

But there are areas in which we do agree.

We do share some very basic and real concerns and have decided to work together to advocate the implementation of policies that we believe best address those areas of concern.

One primary area of concern, and of agreement, is energy. We all understand the very vital role energy plays in every facet of our lives.

We all understand that without adequate, affordable energy supplies, our Nation cannot offer the degree of economic, social or political opportunity that all Americans deserve.

It is clear that real and substantive disagreement exists among the energy experts as to which energy sources and technologies will be available, at what cost and in what amount.

But it is also clear that even at modest rates of growth, 2 percent or so per year, our need for electricity will double in just a few decades.

Because we are looking at a future which will require so much energy, particularly electricity, the prudent, responsible course of action is to develop promising, renewable energy technologies which can provide that electricity.

Clinch River represents one of those technologies. Over the last 30 years we have invested more than $5 billion and millions of man-hours in the development of breeder technology.

Since Clinch River was first conceived 12 years ago, we have invested another $1.5 billion.

By completing Clinch River now, without delay, America will finally be demonstrating, on a large scale, the practical, economic, and environmental viability of a renewable energy technology.

Should we fail to complete Clinch River, we will be wasting not only the $1.5 billion spent on that specific project, but also much of the $5 billion we have put into breeder research over the years.

If we fail to complete Clinch River now, there could also be other implications; implications involving the need to buy the technology from overseas, thereby having a negative effect on American jobs and our balance of trade; implications that will result in the United States not being a part of the international breeder scene, either in the international marketplace or at the nonproliferation table.

Those are the real risks involved. They relate to adequate energy supplies and guarantees of their availability, to the billions of dollars we have invested in developing a renewable energy technology, our national will to bring a long-term effort to fruition, and to the international scene, from which we could be excluded.

In light of those risks, the Government's continued support for Clinch River is prudent, responsible, and appropriate.

Of course, it is not only the Government that has made substantial investments in the technology. The utility industry contribution to Clinch River, which will now reach around $325 million, remains the largest contribution ever made by the private sector to a Government R&D effort.

And while there are some who have suggested that we follow the foreign example and require utilities to pay a greater share of the cost, I wonder if those same people would like to be the ones to go to the public utility industry commission and ask for permission to use ratepayers money for this project?

Indeed, those who suggest that course of action are ignoring great advantages of the alternative finance plan; this plan provided for raising $1 billion from the private sector without impacting anyone's utility rates.

Organized labor has made a substantial contribution to Clinch River as well. We signed, some months ago, a comprehensive agreement with management that, through unique shift arrangements, long-term wage agreements and the removal of the threat of strikes or lockouts, will allow construction to proceed quickly. Under this agreement, it is possible for work to proceed 10 hours a day, 7 days a week. In short, the agreement will result in a savings of millions of dollars to the project.

Let me be very clear about this. There is no question but that organized labor could have gotten more for its members over the long run had we not signed this agreement. But we forwent those long term gains as part of our real and unwavering commitment to this project. This is organized labor's contribution to Clinch River—and it is unprecedented.

Despite these significant efforts, on the part of both labor and industry, there are those who still want more. They suggest that the cost of the project should be borne by industry. We disagree. We think it is entirely unrealistic to expect private investors to risk large sums of money on a project that has experienced as many fits and starts as Clinch River, fits and starts imposed at the Federal level.

We think it is unrealistic to expect investors to risk large sums of money on a project that will be controlled, in its entirety, by the Federal Government.

Clinch River was begun as a Government project and will be completed as a Government project. The private funds that will be applied to its completion represent a rare case of the private sector assisting the Government in the completion of a Government project—a welcome and laudable turn of events.

And why shouldn't this be a Government project? After all, the research and development of energy technologies is a national issue, an issue of economic importance, of national security importance, and of opening the doors of opportunity for all Americans. It is not, as some have suggested, an exercise that will only help industry. It is an effort that will help all Americans. And as such, it is an effort that all Americans should support.

Of course, to the extent that is practical and reasonable, private industry should be expected to share in the costs of efforts like this. We think the alternative finance plan represents such a practical and reasonable step. It is substantive, fair and responsive.

The Committee on Jobs, Environment and Technology represents a broad spectrum of the American population. The coalition represents literally millions of American taxpayers, ratepayers, and consumers.

We view Clinch River as one part of a real commitment to developing and demonstrating renewable energy technologies.

Our interest is not a nuclear or nonnuclear future. Our interest is an energy future of security; an energy future that will afford us the ability to provide abundant employment opportunities and a strong, growing economy.

To retreat now would represent a gamble with that future that we cannot afford. So we ask you to take the positive step. The alternative finance plan before you will allow Clinch River to be completed with a substantially lessened budgetary impact. It will enable us to determine the real viability of the technology. That is the kind of progress we need. It is not enough to say we think we can meet future energy demands. We must be able to say we are doing everything we can to insure that those needs can be met.

The development of renewable energy technologies, such as that being demonstrated at Clinch River, will provide those assurances. This generation and those that will follow deserve no less.

At this time, Mr. Chairman, if there is no objection, I would like to submit for the record brief testimony which is several documents submitted by our committee. Additionally, a letter from Ray Denison, director of Department of Legislation for the AFL-CIO, which states the position of the AFL-CIO, President Lane Kirkland on the issue of Clinch River. I have a statement by Juanita Bryant, president of General Federation of Women's Clubs. I have a statement from J. Stanley Alexander, the National Conference of Black Mayors. I have a statement from the American Nuclear Energy Council.

I have a series of letters, including a letter from the Edison Electric Institute. I have one from the chamber of commerce signed by Richard Lesher. I would like to amend that one, but at this point—I have one from the American Public Power Association. The association, as you know, is a publicly owned power company. I have a letter from the American Nuclear Society; our own statement on jobs, energy, and technology. I have a statement from the SE-2, an organization of scientists and engineers for secure energy. I have a statement from the American Society of Mechanical Engineers. All of these people are active members of CJET and strong supporters of Clinch River.

In addition, I would also—excuse me, they are contained in here. Thank you very much. I will be glad to answer any questions I would be capable of answering.

[Documents submitted by Mr. Mudy follow:]

AMERICAN FEDERATION OF LABOR AND CONGRESS OF INDUSTRIAL ORGANIZATIONS

LANE KIRKLAND
PRESIDENT

815 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20006

THOMAS R. DONAHUE
SECRETARY-TREASURER

LEGISLATIVE ALERT!

(202) 637-5075

September 21, 1983

Dear Senator:

An issue of great importance to the United States is expected to be considered by the Congress in the next few weeks - the Clinch River Breeder Reactor (CRBR). The AFL-CIO believes that an adequate supply of energy is necessary to maintain the well being of the United States and to provide for energy needs of the future -- free of the threat of curtailment or extortionate price.

Essential to achieving this adequate energy supply is continued expansion of nuclear power, a proven source of energy and a necessary ingredient to the Nation's energy mix. To further enhance expansion of the U.S. nuclear program, the nation must pursue development of the liquid metal breeder reactor program, for which the Clinch River Breeder Reactor is a necessary demonstration project and an integral step.

Enlarging the gain for the American economy, and thereby its work force, which would be achieved through completion of the CRBR, is the direct employment impact of the project. The project and its contractors will provide American workers with the equivalent of 3,900 full-time jobs and more than 5,000 other jobs will be supported by project expenditures. Because of the Clinch River Breeder Reactor's importance to growth and employment and its direct effect on thousands of American workers, we believe that it is imperative to go forward with completion of the project.

In response to a directive from the Congress, an Administration proposal has been submitted which would provide private sector financing of much of the remaining cost of the Clinch River Breeder Reactor. The plan is expected to be considered in connection with the Omnibus Continuing Resolution. In the best interests of the American worker, the AFL-CIO strongly urges the Congress to act favorably on the alternative financing proposal and continue funding for the Clinch River Breeder Reactor.

Sincerely,

Ray Denison

Ray Denison, Director
DEPARTMENT OF LEGISLATION

Testimony of
Juanita M. Bryant, President
General Federation of Women's Clubs

Mr. Chairman, members of the Committee. The General Federation of Women's Clubs is the largest and oldest non-denominational, nonpartisan, international service organization of volunteer women in the world, and was chartered by the United States in 1901. The General Federation of Women's Clubs represents one-half million members in the United States, 10 million worldwide. Embracing 52 state federations, including the District of Columbia and Puerto Rico, eight regions, 421 districts and 11,000 clubs.

The General Federation of Women's Clubs submits this testimony today, because of our strong support of the Clinch River Breeder Reactor.

Our membership has voted upon and adopted 23 resolutions concerning energy and environmental policy. Attached is a copy of our 1980 resolution entitled "Energy Crisis" which reads in part:

> "Resolved, that the United States government encourage a comprehensive nuclear power program which will contribute to our present energy needs and realistically prepare for the longer term demand."

Today, with the pressing problems of high unemployment, high deficits and a struggling economy, our attention has been focused on immediate issues rather than long-term energy policy. But a long term energy policy is vital. It will be impossible to sustain any economic growth over a period of time without adequate supplies of energy. The General Federation of Women's Clubs believes that the Clinch River Breeder Reactor Project is the first step towards a long-term energy policy.

During the last decade the United States has learned some important lessons about energy. We have learned that our entire nation can be held hostage by foreign supplies of energy. We have discovered that insufficient or interrupted supplies of energy can directly alter our lifestyles, cost us jobs, and create a national panic.

America is currently dependent upon foreign sources of oil for 1/3 of its supply. Although progress has been made in reducing U.S. dependence on foreign sources of oil, by decreasing energy consumption, stepping-up domestic fuel production and intensifying the development of more efficient energy technologies, we still remain vulnerable to supply disruptions.

Breeder reactor technology is the most promising of the emerging technologies. It will provide clean and abundant energy at low costs for decades to come. It is critical to pursue breeder technology now. Time is of the essence. Even if we adhere to the present schedule, it will still be 10 to 20 years into the next century before commercialization of the breeder. There comes a time when a nation must set its research priorities. This is such a time. A vote against the Clinch River Breeder Reactor Project will plunge the U.S. into last place among those nations researching breeder technology.

TESTIMONY SUBMITTED BY J. STANLEY ALEXANDER, NAT'L CONFERENCE OF BLACK MAYORS
COMMITTEE ON ENERGY & COMMERCE, SUBCOMMITTEE ON ENERGY CONSERVATION AND POWER
HEARINGS ON CLINCH RIVER BREEDER REACTOR PROJECT
September 20, 1983

Mr. Chairman, members of the committee, it is a pleasure to submit the following statement of behalf of Mayor Johhny Ford, the President of the National Conference of Black Mayors.

The National Conference of Black Mayors strongly supports completion of the Clinch River Breeder Reactor. Our support is based on several factors but centered on one crucial point: The ability of poor Americans to achieve the level of economic and social equality they deserve is largely predicated on the availability and cost of energy. And as long as our nation's energy future remains even the least bit uncertain, our responsibility to those who are still struggling, to those on whom the burden of economic downswings disproportionately fall, is to do whatever we can to ensure that the availability of energy is secure.

There are over 230 black mayors in America today. Most of them are Mayors of small, depressed cities and towns. And as an organization, our charge is to look at, analyze and review a range of policy issues that relate to more than the usual federal-state-local relationships. We study and analyze a range of issues that we believe will have an effect--positive or negative--on the ability of our constituents to achieve a degree of economic security. We have an energy task force which is today studying ways in which energy management in small municipalities can be improved. The task force has also taken an active role in discussing with and advising us on a variety of issues. In short, energy is an area in which we have a great deal of interest because we recognize its vital role in all facets of our lives.

It seems almost incredible to us that after the devestating experiences of energy shortages in the 1970's, we are still debating whether or not to demonstrate a renewable energy technology that could, if needed, help ensure that such shortages don't take place in the future. Clearly, breeder reactors are not the whole answer. But they are one part of a bigger picture. This is not and should not be viewed as a question of a nuclear power future or a non-nuclear future. It is a question of energy, of whether or not we are going to take the steps necessary to ensure a secure energy supply. To many of us who represent minorities and other Americans at the lower end of the economic ladder, those steps represent crucial steps on our road to economic, social and political opportunity.

When it comes to the fiscal issues, we are as sensitive as anyone to the concerns that exist. As many of you know, we have opposed many budget cuts that have been made. That is what makes the alternative finance plan now before you so attractive to us. It does, in fact, reduce the budgetary impact of Clinch River. And it does, in fact, provide for more private participation in the project. In analyzing the budgetary question therefore, we are now faced with the question of terminating a project on which a billion and a half dollars has already been spent, thereby wasting those funds, or completing the project, with assistance from the private sector, and demonstrating a technology with great promise. To us, the latter seems to be the most reasonable and responsible course of action.

In his testimony, Bob Georgine indicated that CJET is a broad based coalition, We are proud to be a part of the coalition, as is the National Black Caucus of State Legislators. CJET represents one instance in which an incredible range of interests have come together. The fact that those interests include business and labor, minorities and women, speaks for itself. We support Clinch River and urge the Congress to continue its support as well.

AMERICAN NUCLEAR ENERGY COUNCIL
410 FIRST STREET, SE • WASHINGTON, DC 20003
(202) 484-2670

THOMAS R. KUHN
PRESIDENT

August 29, 1983

Honorable Ronald W. Reagan
The White House
Washington, DC 20500

Dear Mr. President:

On behalf of the American Nuclear Energy Council, and the industry leaders representing the other organizations that joined us, I would like to extend our deep appreciation to you for taking time out of your busy schedule last month to meet with us on nuclear energy issues.

The meeting was of great importance to our industry. All who attended were impressed with your knowledge of our issues and most appreciative of your support. The session with Ed Meese, Don Hodel, Jay Keyworth and Fred Khedouri on the "Nuclear Power: Agenda for the '80s" was most productive. Your active support, and that of your Administration, is well recognized within our industry, but a meeting such as this one significantly reinforces it and establishes a course of action on the principal issues.

With respect to the Clinch River Breeder Reactor, the demonstration project which is an integral step in this Nation's breeder reactor program, industry representatives are aggressively campaigning and meeting with Members of Congress and their staff soliciting support for the project. The focus of this effort is the alternative financing plan for the Clinch River project recently submitted to Congress by the Department of Energy. The industry strongly supports this plan and commends your Administration for its action.

On behalf of the nuclear energy industry, thank you for meeting with us on the many issues affecting the industry. In particular, thank you for your personal assistance and support regarding the Clinch River Breeder Reactor.

Sincerely,

Tom Kuhn
Thomas R. Kuhn

TRK/jei

WILLIAM McCOLLAM, Jr. President

EDISON ELECTRIC INSTITUTE The association of electric companies

1111 19th Street, N.W.
Washington, D.C. 20036
Tel. (202) 828-7400

August 24, 1983

The President
The White House
Washington, DC 20500

Dear Mr. President:

On behalf of the Edison Electric Institute (EEI), I would like to thank you for meeting with industry and labor representatives on July 21, to discuss with us the Clinch River Breeder Reactor Project.

EEI's members, investor-owned electric utilities that serve over 67 million customers and provide 77 percent of the nation's electricity, continue to strongly support the completion of the Clinch River Breeder Reactor. We are grateful for your commitment to the Project and for your endorsement of the recently-unveiled supplemental, private financing plan.

Mr. President, active Administration and industry support are crucial to the outcome of the Congressional battle in September. We look forward to working with you to complete the Project, the key element of America's breeder reactor program and a step toward energy security.

Sincerely yours,

William McCollam, Jr.

William McCollam, Jr.

WM:fcg

bcc: Messrs. Frederick L. Webber
Walker F. Nolan

CHAMBER OF COMMERCE
OF THE
UNITED STATES OF AMERICA

RICHARD L. LESHER
PRESIDENT

1615 H STREET, N.W.
WASHINGTON, D.C. 20062
202/463-5300

September 12, 1983

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

On behalf of the U.S. Chamber of Commerce, I want to thank you for your personal commitment to help assure continued congressional support for the Clinch River Breeder Reactor Project (CRBRP).

The Chamber supports the orderly development and production of domestic energy resources and believes the completion of the CRBRP is essential to assure future economical supplies of electricity. Our members are willing to support investment now to assure this future.

The alternative CRBRP financing plan recently submitted to Congress by the Department of Energy, calling for one billion dollars from the private sector, is a further positive step toward realizing the goal. We are pleased it has your endorsement.

Because of our commitment to the development of this energy resource, and our concern for its outcome in the Congress, I consented to serve on the Advisory Committee of the Committee on Jobs, Environment and Technology. With your help, and that of members of your administration, the business community and the members of the Building and Construction Trades Department, AFL-CIO, I am hopeful that once again CRBRP will continue. I look forward to working with you to this end.

Sincerely,

Richard L. Lesher

AMERICAN PUBLIC POWER ASSOCIATION
2301 M STREET NW WASHINGTON DC 20037 • 202/775-8300

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WILLIAM C. WALBRIDGE
Seminole Electric Cooperative
Tampa, Florida
ROBERT C. YOUNG
Burlington, Vermont

August 12, 1983

The President
The White House
Washington, D.C. 20500

Dear Mr. President:

Your willingness to meet recently with electric utility, nuclear power and labor representatives and your expression of support for the Clinch River Breeder Reactor Demonstration Project are most appreciated.

The American Public Power Association, which represents more than 1,750 municipal and other local public power systems throughout the United States, has endorsed the Clinch River Project as a means to insure an adequate and reliable source of electric power in the decades ahead. This advanced energy technology will help achieve a more secure energy future and will provide a viable energy option which can enhance our fuel flexibility.

The Administration's support of the federal-private sector financing plan is a positive sign that this Project can get back on track and that this Administration is committed to the completion of this Project.

Sincerely,

Alex Radin
Executive Director

AR:af

AMERICAN NUCLEAR SOCIETY
555 North Kensington Avenue, LaGrange Park, Illinois 60525 USA
Telephone: (312) 352-6611 • Telecopier: (312) 352-0499 • Telex: 254635

PRESIDENT
Milton Levenson
Bechtel Power Corporation
50 Beale Street
San Francisco CA 94105 USA

August 17, 1983

The President
The White House
Washington, DC 20500

Dear Mr. President:

On behalf of the American Nuclear Society and its 14,000 professional members, I would like to thank you for meeting with our representative as well as others of the nuclear industry and labor. Your endorsement and support of the nuclear program so essential to a secure supply of electricity for our country was very much appreciated.

As a professional society whose members are active practioners in all fields of science and technology, we are especially sensitive to the importance of the development and demonstration of new technology. Clinch River fulfills that role in our breeder program. Clinch River is not an end in itself; it is an important anchor point on our breeder reactor learning curve and we are encouraged by your personal attention to this important issue.

I would like to add my personal thanks to those of the Society for your taking the time to endorse Clinch River, nuclear power and, by implication, the essential nature of electricity.

Sincerely yours,

M Levenson

Milton Levenson

ML/pw

Committee on Jobs, Environment and Technology

Robert Georgine
President, Building and Construction Trades Department, AFL-CIO
Chairman

210 Seventh Street, S.E.
Suite 59
Washington, D.C. 20003
(202) 547-7036

August 19, 1983

- Building & Construction Trades Department, AFL-CIO
- National Association for the Advancement of Colored People
- American Association of Engineering Societies
- American Nuclear Energy Council
- American Nuclear Society
- American Public Power Association
- Americans for Energy Independence
- Atomic Industrial Forum, Inc.
- Edison Electric Institute
- General Federation of Women's Clubs
- International Association of Bridge, Structural and Ornamental Iron Workers
- International Association of Heat & Frost Insulators and Asbestos Workers
- International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers & Helpers
- International Brotherhood of Electrical Workers
- International Brotherhood of Painters & Allied Trades
- International Union of Bricklayers & Allied Craftsmen
- International Union of Elevator Constructors
- International Union of Operating Engineers
- Laborers' International Union of North America
- National Association of Manufacturers
- National Black Caucus of State Legislators
- National Conference of Black Mayors
- National Rural Electric Cooperative Association
- National Society of Professional Engineers
- New England Council
- Operative Plasterers & Cement Masons International Association of the United States & Canada
- Scientists & Engineers for Secure Energy
- Sheet Metal Workers International Association
- Tile, Marble, Terrazzo Finishers & Shopmen International Union
- U.S. Chamber of Commerce
- United Association of Journeymen & Apprentices of the Plumbing & Pipefitting Industry of the United States & Canada
- United Brotherhood of Carpenters & Joiners of America
- United Union of Roofers, Waterproofers & Allied Workers
- Utility Workers Union of America
- Youth for Energy Independence

President Ronald Reagan
The White House
Washington, D.C.

Dear Mr. President:

On behalf of the thirty-six member organizations of the Committee on Jobs, Environment and Technology, and on behalf of the numerous utility and nuclear industry representatives with whom you met on July 21, I want to extend our sincere thanks for your time as well as for your strong vote of confidence in the Clinch River Breeder Reactor Project.

As you know, Clinch River is a project about which we feel strongly. It will demonstrate an energy technology with a vast potential and, as I mentioned in my June 15 letter to you, can now be completed under an unprecedented partnership of the private and public sectors. With our energy future so full of questions, Clinch River represents an opportunity we cannot afford to let pass.

We have a difficult but winnable fight ahead. There is no doubt that the assistance of your Administration will be a crucial factor in a successful effort. We are therefore, greatly appreciative of the commitment you have made to helping assure continued Congressional support for Clinch River. I can assure you that all of us will also be devoting a great deal of our resources towards achieving that goal.

Again, our thanks for your time and your support. Our thanks as well to Secretary Hodel, and Messrs. Meese, Keyworth and Kehdouri. We look forward to working with you and your administration on this important issue.

Sincerely,

Robert Georgine, Chairman
Committee on Jobs, Environment and Technology
President, Building and Construction Trades Dept., AFL-CIO

SE$_2$ SCIENTISTS AND ENGINEERS FOR SECURE ENERGY, INC.

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Erich Isaac, Vice Chairman
Robert K. Adair, Vice Chairman
Miro M. Todorovich, Executive Director

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*Member,
Steering Committee

Affiliations for
identification only

September 8, 1983

Honorable Ronald W. Reagan
The White House
Washington, DC 20500

Dear Mr. President:

On behalf of the more than fifteen hundred professional members of Scientists and Engineers for Secure Energy, I would like to commend you for your endorsement of the Clinch River Breeder Reactor Project.

We at SE$_2$ agree with you that completion of the Clinch River reactor is essential to the United States' continued role as a leader in technology.

SE$_2$ member Dixy Lee Ray has said "the [Clinch River] project will provide very valuable operating experience for our engineers; experience that will be extremely important in the future." We are at a juncture in our nation's history where we can ill afford to lose such a valuable training ground or the energy security which breeder technology will provide.

We again thank you for your support of this vital project and we invite you to call on us if the counsel and consensus of our members should prove helpful.

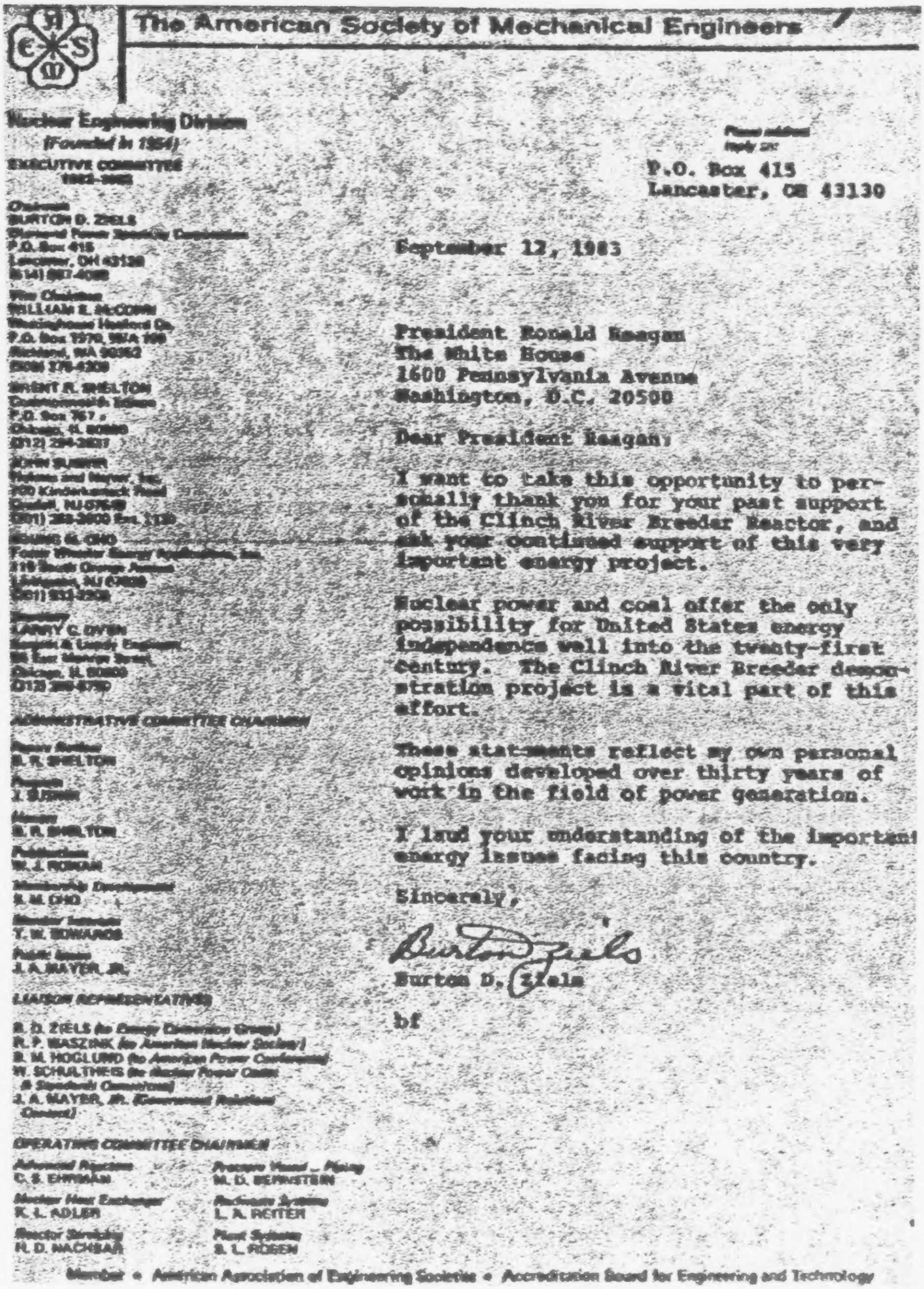
Sincerely,

Miro M. Todorovich

Miro M. Todorovich
Executive Director

cc: Dr. George Keyworth

1225 Nineteenth Street Northwest • Suite 415 • Washington, D.C. 20036 • (202) 223-5381



The American Society of Mechanical Engineers

Nuclear Engineering Division
(Founded in 1954)

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Please address reply to:
P.O. Box 415
Lancaster, OH 43130

September 12, 1983

President Ronald Reagan
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Reagan:

I want to take this opportunity to personally thank you for your past support of the Clinch River Breeder Reactor, and ask your continued support of this very important energy project.

Nuclear power and coal offer the only possibility for United States energy independence well into the twenty-first century. The Clinch River Breeder demonstration project is a vital part of this effort.

These statements reflect my own personal opinions developed over thirty years of work in the field of power generation.

I laud your understanding of the important energy issues facing this country.

Sincerely,

Burton D. Ziels

Burton D. Ziels

bf

Member • American Association of Engineering Societies • Accreditation Board for Engineering and Technology

STATEMENT OF JILL LANCELOT, DIRECTOR, CONGRESSIONAL AFFAIRS, NATIONAL TAXPAYERS UNION

Ms. Lancelot. Thank you for inviting us to testify today on behalf of the Taxpayers Coalition Against Clinch River. I myself am director of congressional affairs of the National Taxpayers Union. The coalition includes 16 different organizations which represents millions of Americans. We are a diverse group including taxpayers, fiscal conservative, labor, business, environmental, consumer, church, and scientific groups.

Although we may have differing opinions regarding nuclear power, we are united in our opposition to Clinch River. The chapter in the Clinch River story is unlike earlier ones. The proponents of this project are determined to get this plan enacted as quickly as possible, even though it does not answer the congressional mandate to reduce Federal budget requirements.

Unfortunately, it is the taxpayer who is still left holding the bag. We see private interest continue to publicly claim that this project is necessary, yet they express no real interest or ability to directly finance the project.

We see the special interest spending a great deal of money on expensive public relations campaigns in an attempt to fool the public into thinking this is a great plan and a worthwhile project. They've taken out lavish newspaper ads claiming that, quote, "we can't afford not to build Clinch River," and that they, quote, "have met the challenge." These are empty slogans that only hold up if left unquestioned. In reality, they have failed to meet the challenge that Congress has set for them, which is to reduce the taxpayer burden of the Clinch River and increase their share of this questionable project.

It is doubly distressing, when it purports to abide by the principles of the free market, continues to support this project. The administration has ignored the finding of its own private sector survey and cost control. The J. Peter Grace Commission questioned the wisdom of continued funding of Clinch River.

I would also like to mention that this cost-sharing plan is disturbingly reminiscent of the planning and financing of the WPPSS in Northwest, the largest public bond in history is bought on an investment of nuclear generating capacity. It would be fine to commit the public once again to bonds that are guaranteed on the basis of sale power to a region that may be saturated with electricity.

We would like to think we've learned our lesson. Future impacts of this plan must be carefully evaluated. The plan incorporates a series of budget funding mechanisms which would require Federal guarantees and tax breaks that may cost taxpayers millions of dollars in years to come.

This shift to the off-budget sector, coupled with $1.5 billion appropriation request is hardly cost sharing. True cost sharing would provide upfront hard cash and an industry as well.

In addition, the multiyear appropriation effectively removes Clinch River from any congressional oversight. The time has come for Congress to face the Clinch River issue squarely because there is no true cost-sharing plan. It is time to stop wasting taxpayers' money.

The proponents have had at least since last December to come up with a workable cost-sharing plan. Since they have not produced one, we must assume they cannot produce one. We believe that the time has run out and the only thing left to do is terminate the project.

I would like to ask that our entire testimony be submitted for the record, and I also have a statement from Kenneth J. Arrow who was awarded the Nobel Memorial Prize in Economics. He is now currently at Stanford University. We would like to have this statement submitted.

The CHAIRMAN. They will be made part of the record.

[The prepared statements of Ms. Lancelot and Mr. Arrow follow:]

STATEMENT OF JILL LANCELOT, DIRECTOR OF CONGRESSIONAL AFFAIRS, NATIONAL TAXPAYERS UNION, AND FRED SMITH, DIRECTOR OF GOVERNMENT AFFAIRS; COUNCIL FOR A COMPETITIVE ECONOMY

I am Jill Lancelot, Director of the Congressional Affairs Office of the National Taxpayers Union; Fred Smith is Director of Government Affairs for the Council for a Competitive Economy. We are speaking today on behalf of the Taxpayers Coalition Against Clinch River concerning the Breeder Reactor Corporation's (BRC) June 23, 1983 report on alternative financing possibilities for the Clinch River Breeder Reactor (CRBR) project.

The Taxpayers Coalition includes 16 different organizations which represent millions of Americans; we are a diverse group including taxpayer, fiscal conservative, labor, business, environmental, consumer, church and scientific groups. We may have differing opinions with respect to nuclear power, but are all united in our opposition to this project.

Over the last two years, the Coalition has played a major role in providing the facts concerning the costs and benefits of this project to the American people and their elected representatives. In part because of our efforts, many groups have come to question the economic, political and/or technical rationale for this project. These include spokesmen from the Heritage Foundation, the American Enterprise Institute, and the Federation of American Scientists; the National Review and the Reader's Digest; the League of Women Voters and Coalitions for America; the United Mine Workers and Free the Eagle. Senators such as Gordon Humphrey and Dale Bumpers and Congressmen such as Howard Wolpe and Vin Weber -- liberals and conservatives, Democrats and Republicans -- all have joined in opposition to the Clinch River program.

As representatives of the Coalition, we appreciate the opportunity to present our views today.

Background on the Clinch River Project:

When the Clinch River Breeder Reactor was first initiated in the early 1970s, there was some rationale for its construction. Electricity demand was increasing rapidly and nuclear power was expected to supply an increasing percentage of that demand. Moreover, known uranium reserves appeared extremely limited and many were pessimistic about the prospects for new discoveries. All these factors suggested that uranium might become extremely expensive. Based on this scenario, the case for some alternative fuel source appeared compelling. As we shall later discuss, reality did not follow this course.

However, it is important to note that even in these early days, the project was considered a demonstration project similar to the earlier light water reactor demonstration program of the 1950s. Those that would benefit from this project -- the nuclear utilities and the nuclear vendors -- were expected to pay a substantial portion of all costs. Government was thought to have a role in the basic and applied research fields, but was thought to have little role in the economic testing and validation of the resulting technologies.

This finding was most recently endorsed anew by the findings of the President's Private Sector Survey on Cost Control (the Survey headed by Peter Grace) in its review of the Department of Energy's programs. Their report noted that "Federal R&D responsibilities do not call for the demonstration of existing technology as a major step toward commercialization, because that step should be taken by the private sector whenever it deems that the time is ripe." The Grace report went on to note that ". . . . Nevertheless, some very large, current DOE programs fall into this [demonstration] category -- the Clinch River Breeder Reactor (CRBR) Program . . . Each involves the prospective investment of additional billions within the next few years, and each should be reviewed." Federal funding of this project has always been in conflict with the view that the private sector, not government should determine which technologies and when these technologies should be brought to the market place.

Limiting the role of government in the commercialization area is important. Many studies have found that government is particularly inept when it comes to replacing the incentives necessary for technology to survive a market test. A recent survey reported in Science, "Industrial Innovation Policy: Lessons from American History," concluded that: "A fourth type of policy, under which the government attempts to pick winners, has been a clear-cut failure." Government's failure in this area should not be surprising. Commercial success requires that the technology meet a market test, a test that government is poorly equipped to pass. The incentives and knowledge necessary for a project to succeed are unlikely to be acquired by a hired hand. Entreprenurial success is a field in which individuals, not bureaucracies, excel. As we later show, the chances that the Clinch River project would ever be successful have been further diminished by this new plan.

As noted, the original breeder demonstration program anticipated rapid increases in the price of uranium. That expectation never materialized, but it did trigger new efforts to discover and exploit new supplies of uranium. These were successful. Moreover, nuclear technology improved and in fact is still improving in ways that allow greater energy to be extracted from a fixed quantity of fuel. Uranium goes further now than it once did. But most significantly, the delivered costs of electricity from nuclear plants began to increase rapidly. That increase, however, was not due to any increases in fuel costs, but rather to a drastic increase in the capital costs of constructing nuclear power plants. Moreover, the OPEC crisis triggered a general increase in the price of energy and led to a sharp reduction in the level of energy consumption per unit of economic activity. This price-induced conservation forced all utilities to reassess their capital expansion plans. Increasing costs of nuclear power plants made them special candidates for cancellation. Early optimistic estimates by the nuclear industry that some 1,400 reactors would be on line by the year 2,000 were slashed -- we now anticipate that only some 150 are likely to be operating in that period.

The cumulative impact of all these factors has destroyed the economic viability of the Clinch River project and makes it extremely unlikely that any breeder technology is likely to be commercially viable in the near future. And again this point is not disputed by most objective observers. The most recent and dramatic confirmation of the scenario sketched out above was provided by Dr. Donald Rice, President of the Rand Corporation, in response to a letter requesting the views of the Rand staff on the merits of the Clinch River project. Rice enoted that the fundamental issue was whether the CRBR project constituted "the best path to meeting long-term national energy goals and a sound strategy for ensuring that nuclear energy supply options are avaiable as needed." Rice identified five conditions he believed must be met for this question to be answered affirmatively:

* Electricity demand would have to increase at a rapid rate over the next two decades.

* The number of light water reactors operating in the 1980s and 1990s would have to be large and increasing.

* Projected uranium prices would have to be much higher than current prices.

* Some cost-effective means of reprocessing fuel would have to be available.

* No superior breeder technology should be available for demonstration.

Rice pointed out: "At this time, neither we nor most observers believe that any of these conditions hold," and urged that ". . . we eschew commiting ourselves to the CRBR and the strategy that it embodies."

Naturally, these problems did not emerge overnight. Indeed, the Rand statement summarized above restated concerns that Rand had expressed some eight years earlier to the director of the Energy Research and Development Administration. But as the costs of the project have increased, and the beneifts have faded away, there has been little willingness on the part of the Clinch proponents to reassess the wisdom of proceeding. Instead they have sought an open-ended commitment from the U.S. taxpayer.

That refusal to face reality has led to the political fight over funding that continues to this day. But there has been some progress. Both the House and Senate have eliminated funds for CRBR from the Fiscal Year 1984 Energy and Water appropriations bill until such time as an acceptable cost-sharing plan can be defined and enacted. DOE was given explicit instructions to reduce the federal share of CRBR funding by soliciting additional private sector financing. The legislative language required DOE to "vigorously explore proposals, including a reconsideration of the original cost-sharing arrangement that would reduce federal budget requirements for the Clinch River project."

That original arrangement, we might recall, required the utilities and the nuclear vendors to pay 40 percent of the project's total anticipated cost of $700 million in exchange for the free access to what remained a totally government-owned facility. Had the DOE-BRC report provided us a plan patterned after this original model, we might be considering a true cost-sharing proposal.

Unfortunately, the plan that DOE and BRC have produced fails totally to consider such an option. Their "cost-sharing" plan is neither that nor a cost-reduction plan but rather an alternative financing scheme. Asked to reduce the impact on the U.S. taxpayer, they have responded with a "creative financing" package instead. As Shelby Brewer, Assistant Secretary of Nuclear Energy, has admitted, the plan . . . "is simply moving money around in time." Costs are moved off-budget and paid in different ways, but the Clinch River burden on the taxpayer is left unchanged. The plan provides no new private money and requires the private sector to assume no new risks. The defined "new" funding is obtained from the sale of assets now assigned to the federal government, from reduced tax collections, or from new federal guarantees. Regardless of plant performance, every dollar of private "investment" will be repaid with interest from the U.S. Treasury. An investment that pays off even in the event of failure is not typical in the private sector.

The initial variant of the cost-sharing plan was submitted to Congress in March where it met a chilly reception. That plan was critiqued by the General Accounting Office (GAO). GAO observed: " . . . while the proposal will probably change many of the existing project arrangements, the federal government appears to retain most of the risk if the project fails or if the cost overruns occur." That plan was returned for revision, but the version we now have before us is merely the old plan with a new date. The claims of the BRC Task Force that this plan "embodies a specific plan for raising $1 billion of private capital" and that "one billion dollars represents 40 percent of the estimated remaining cost to complete the project" have been heard before. The only difference today is that the industry has decided to say it louder. The nuclear industry may not believe in Clinch, but they certainly believe in PR. The display ads in the Washington Post yesterday say much about their faith in that approach.

The plan itself defines four separate financing elements that sum to the projected $2.4 billion price tag for completing the project. Needless to say, only the federal government has any liability if the project exceeds this figure. And those who believe that this estimate is hard and fast will probably believe other things. Let us consider each component.

1. A DIRECT GOVERNMENT MULTI-YEAR APPROPRIATION OF $1.4 BILLION:

Under the plan, Congress will appropriate $1.4 billion in a one time multi-year appropriation. These monies will be disbursed as needed over the seven year construction cycle. The primary problem with this feature of the plan is that it removes the project from subsequent congressional review. Many things can happen over the next seven years that might lead rational men to reconsider the wisdom of spending further taxpayer revenues on this project. Indeed, some have already come to such a conclusion. And this fact -- nothing else -- explains the rationale for multi-year funding. The merits of Clinch are non-existent already and this fact has become apparent to almost everyone. Over the next few years, the costs of this project are likely to mount still further while the benefits are likely to drop. The Clinch proponents wish to avoid any further scrutiny of this project and thus have elected this approach. Needless to say, nothing in this provision of the plan reduces in any way the costs of this project to the taxpayer.

2. A UTILITY CONTRIBUTION OF $175 MILLION:

The utilities that have participated in the Breeder Reactor Corporation are to provide $175 million to the project. However, this amount is simply the commitment they have already made to the project less that already contributed adjusted for interest payments. This is the amount already owed but not yet paid to the CRBR under the terms of the original agreement. Over the last several years, utilities have been extremely reluctant to advance any more monies to this project. In fact, utilities have made no contribution since 1977. This scarcely indicates their confidence in Clinch.

The current plan may well signal a reduced commitment on the part of the participating utilities, and thus a lessened involvement by the private sector in the overall financing of Clinch. The original pledge was a private sector vote of confidence in the value and feasibility of the project -- if the project failed, the utilities would lose their investment. The current plan seems to provide assurances that in such an event, the utilities would be reimbursed. This point should be clarified. Exactly what is the nature of the investment by the utility companies under this "new" plan. Are the risks to be borne by the utilities the same as they were under the original scheme or not?

And there is one other disturbing factor related to the utility involvement. Even if Congress approves this plan, we have no guarantee that the state public utility commissioners will approve the rate increases necessary to raise the monies required. The significance of this point was highlighted in a letter from James Wilson of the National Association of Regulatory Utility Commissioners. Mr. Wilson noted that many states limit or totally forbid utilities to increase rates to reflect construction work in progress -- a situation that certainly will characterize Clinch for some time. He went on to note that utility commissioners are already experiencing difficulty with raising rates to cover costs of plants cancelled because of excessive generation capacity and other cost factors. And noted in conclusion: "It would appear more appropriate for the federal government to finance the Clinch River Breeder Reactor in its entirety than to burden the electric utility industry with a portion of its cost." These statements do not create any confidence that we will obtain even the old private sector contribution -- much less any new financing.

3. A NEW ENTITY, THE AMERICAN ENERGY DEVELOPMENT CORPORATION, WILL SELL "EQUITY SHARES" TO RAISE $150 MILLION:

This contribution again represents no new private sector investment, but instead represents the tax shelter value of the depreciation, accelerated depreciation, tax investment credits and research and development tax credits possible had Clinch been financed as a private activity. More simply put, "new" private funding is attracted by reducing "old" tax liabilities. A distinction that makes little difference to the rest of us who will continue to pay for Clinch.

Moreover, unlike the tax benefits that are offered in most tax shelter schemes, this plan requires the government to guarantee that the anticipated tax advantages will be allowed. It asks for: "assurances that all tax credits, deductions and other tax incentives related to the privately-financed portion of the project, will be available to the private investors as planned" and that if these tax incentives are not available, there should be sufficient government funds available for repayment to private investors. As many know, such guarantees are not customary in the private sector.

One final point: for DOE to enter the tax shelter game, at a time when efforts are being made elsewhere in government to clarify and rationalize the tax system seems particularly questionable.

4. "INTERIM FINANCING" LOANS OF $675 MILLION WILL BE FLOATED ON THE PRIVATE MARKET:

The plan envisions raising $675 million from "interim financing" loans that will in turn be refinanced in 1990 as long term bonds secured by the earning stream of the project. In effect, these long term bonds are revenue bonds secured by the sale of electricity expected to be produced from the Clinch River facility. In the original plan, the plant was totally owned by the government. Thus, this plan will attract "new" financing by giving away "old" assets.

But these assets are clearly not valued very highly by the private sector. Had they been valuable in their own right, Clinch would have been built by the private sector many years ago. Instead, the plan envisions a vast array of guarantees. These are no ordinary private-sector loans; the plan explicitly states that the federal government must guarantee the principle, tax benefits, and rate of return on the bonds. Further, if the long term financing arrangements don't materialize as anticipated or if the project fails to produce the quantity of electricity expected or if the electricity price is lower than projected . . . or if anything else happens, the taxpayer is made liable. The investors are provided an opportunity to purchase a risk free asset that happens to be labeled Clinch River -- the investor of course is purchasing the guarantee, not the Clinch project.

Not only is this policy destructive in its own right, it also threatens to undermine the incentives required for the project to have any chance of success. A complex technical project requires all involved to work to the peak of their abilities. The private sector creates important incentives that encourage that behavior. Individuals who succeed are rewarded; individuals who fail, lose their investment. This plan eliminates all such incentives. Consider for example a situation in which Clinch is built and works but somewhat less efficiently than hoped. As a result, the plant breaks even -- but just. In that situation, the plan encourages the manager to stop trying, let the plant fail, and let government increase your earnings. A scheme better designed for failure is hard to imagine.

But no one should be surprised that private investors are reluctant to purchase Clinch River bonds based on any real anticipation that the bonds might be repaid from project revenues. A recent GAO report concluded that the CRBR was unlikely to pay for itself over its lifetime. An inadequate revenue stream provides little collateral to attract true private sector financing. In part, this problem stems from the factors cited earlier in the Rand comment: electricity is likely to be in over-supply in the period when the CRBR comes on stream. TVA has stated it anticipates little need for this generation capacity; and in the relevant region, five nuclear power plants have already been cancelled. The collapse of the Washington Public Power Supply System (WPPSS) should have taught us a lesson about the discipline reality can impose on even the most enlightened planners. The WPPSS mistake reflected reasonable expectations about future energy needs; if we proceed with this plan, we will be advancing on the basis of expected surplus capacity. It is folly and the antithesis of private sector wisdom to base any financing scheme on the anticipated sale of a product projected to be in oversupply.

In summary, this plan fails to address the concerns that motivated Congress to call for a new financing scheme. Congress wished a reduction -- not a rearrangement -- of the federal contribution to Clinch. This plan displays a distressing lack of candor. The special interests that want this project have spent and are spending a great deal of money — not to build the project — but to fool the public into approving taxpayer funding of the project. Expensive newspaper ads claim that this plan has "met the challenge." It has not. There is nothing here that was not here in March and even less than was here in April. Congress should admit that Clinch has failed the market test, and eliminate this project once and for all.

TESTIMONY OF KENNETH J. ARROW
THE CLINCH RIVER BREEDER REACTOR FINANCING PLAN

To identify myself, I am currently Joan Kenney Professor of Economics and Professor of Operations Research at Stanford University. I have been at different times President of the American Economic Association, the Econometric Society, and The Institute of Management Sciences. I was awarded the Nobel Memorial Prize in Economic Science for 1972. None of these organizations has any responsibility for any testimony I am giving here.

The breeder reactor is to be judged on purely economic grounds. It is after all simply a way of producing electricity more cheaply. Specifically, it is designed to reduce the input of uranium, which is sometimes anticipated to be more costly in the future because of growing scarcity and growing demand. One rarely gets something for nothing; in this case, the decrease in uranium inputs is offset by an increase in capital costs.

We have an excellent mechanism for deciding whether or not projects are economically worthwhile, namely, the market mechanism. If there is a profitable activity, investors will be found to undertake it. I am prepared to accept that there are exceptions to this principle. Certainly this is true when there are non-market consequences of economic actions, as in the case of pollution; but that is not at stake here. It is also possible in some cases that innovations of broad social benefit and high cost will not be undertaken by the market because the innovator will not retain enough of the profits. That principle also does not seem to be applicable in this case.

Indeed, the question is whether at this stage of knowledge, it is economically worthwhile going ahead with the Clinch River reactor. The question has been put to the market, and the answer it gives is clearly No. Public financing has been properly rejected. Now a task force to the Breeder Reactor Corporation comes up with an alternative which has the form of private financing but none of its substance. The debt component of the financing will be guaranteed by government contracts, that is, a commitment to appropriate Federal funds in the future; the equity component is supported by extensive tax credits and other incentives, backed by additional governmental contracts if need be. In addition, the government must contract to support replacement power costs and uninsurable torts. All this is set forth with admirable if brutal clarity in the Appendix to the task force report. As the report notes, the financing requires that all project risks be eliminated.

In short, we have a proposal for government spending, just as before, with some bookkeeping changes. The reasons for limiting government spending after all are prevention of inflation through additional demand, lowering of interest rates through reducing the deficit, and simply avoiding waste of resources. The proposed Clinch River financing fails on all three tests. The increased demand for resources, wasteful as judged by the market, is there; and the bonds to be floated with government guarantees create the same pressure on interest rates as would an equal amount of government bonds.

I strongly urge the committee to reject the task force's proposals.

STATEMENT OF FRED SMITH, DIRECTOR OF GOVERNMENT AFFAIRS, COUNCIL FOR A COMPETITIVE ECONOMY

Mr. SMITH. I am Fred Smith. I am with the Council for Competitive Economy, a business group organized to oppose those groups who talk free enterprise while asking for special favors, and I represent the Council of Taxpayers Coalition Against Clinch River.

This, of course, is the last of a series of efforts to try to defend the Clinch River project. We saw Clinch River proponents chastised in their effort to obtain a direct up front Federal subsidy, and finally realized there was no reason why taxpayers should subsidize the project and continue to demonstrate the commercial feasibility of this ecology.

We are here today because the Clinch River proponents and the bureaucratic allies in DOE were asked to see whether there yet might be someone in the private sector willing to pay something for this project. I was surprised few people have followed this issue. No private investor interests were found to rush into a project, where to date only public sector fools have been willing to tread.

We are here today to discuss the problems of this cost-sharing plan. Our written testimony illustrates the problems in some detail.

Proponents show the value of this new plan as a private sector initiative, a way of reducing the Federal cost of this project and a dramatic reaffirmation of the private sector confidence in the project. In fact, the plan is a failure.

We are told the projections are hard and fast. Note, however, the projections are not hard and fast enough to justify any private sector assumption of risk. This act in itself is a condemning of the project. The project, by the claims of its proponents, is now 90 percent completed, and yet no one is sure enough about its prospects to invest any money.

There is no doubt that under the proposed cost-sharing plan investors will put money into the project, but their investment is for the new guarantees, not the old project. The Government has simply assigned a portion of total Treasury borrowings of the Clinch River project.

Professor Haverd, of Harvard, in a early hearing on the House side noted the purchase of so totally guaranteed bonds is private sector financing, then all of Government is private sector finance.

This point that the guarantees provide the value, not the project, is highly significant. Neither the nature of the Clinch River projects, or their market value potential have any relevance to the assurances provided the investors.

I have made the point, and I am not being facetious about this, but the guarantees available under this plan would make it possible to finance a Clinch River facility if it were engaged in the production of mud pies. These guarantees weaken the incentives necessary for any project to work. Managers, suppliers, and other involved in this project will basically be off the hook if they work hard and the project gets into trouble. They may or may not be successful, but if they throw in the towel, everybody gets their money back.

Do we really want to weaken the incentives to make the project work? There is a number of questions about the tax benefits of the plan. I think the major thing we can say about the tax benefit proposals is that, as I understand it, tax benefits are to award entrepreneural risk. Since there is no such risk in this project, there seems to be no reasons for tax benefits to be considered at all.

Treasury, in an earlier statement, suggested there would be no net affects on treasury or revenues received by treasury of the tax benefits under this plan. If that is true, what we are really talking about is shifting tax shelters around the economy from high value private sector investments in homes and small businesses and so forth, to a project that, as we mentioned earlier, has been rejected by the private sector today. Do we really want government to be manipulating the story in the credit market? We don't have enough credit out there to provide jobs already.

Then, of course, the real question is whether the treasury should be involved in tax shelters. We've had a lot of questions about it in other forms. These are the details in the Clinch River project, and I think it is important also that we step back and see what kind of a farce we have been constructing here.

In the private sector, if you want to build a powerplant, you go to your investment banker. You don't go to your Senators. When you get there you show signed contracts, letters of intent, engineering feasibility studies and earnest money. You don't go around showing a full page ad in the Washington Post. In the private sector investors take risks. Lots of things may go wrong. If you are right, you can make a lot of money, but if you are wrong you can lose your shirt. There are no hell or high water guarantees in the real world.

This Nation unfortunately seems to have experienced two types of energy policies. We went through a era of bad rhetoric, the market doesn't work and the bad policies have flowed from that. The Reagan administration issued what my group felt was a good rhetoric, the market works. Unfortunately, we still have the same bad policy, subsidize Clinch. Isn't it time we start bringing our policies in line with our rhetoric?

As you know, Mr. Chairman, in an earlier discussion of this issue, I characterized this plan as socialism wearing an Adam Smith tie. I say to my friends in CJET, I wear an Adam Smith tie, but I think I know what Grandaddy Smith really had in mind about that project.

I think our return to a principle approach to energy development would be valuable to the nuclear industry as well as the Nation. The nuclear industry has made a deal with government, receive subsidies and caps on liability in return for regulation and a government industry partnership. I think that not only foreshadows many of the problems of national industrial policy, but it's been a disaster for the industry as well as the Nation. Leaders of those industries have been second-class politicians rather than first-class competitors. They have increasingly found themselves dead-end technologies with nowhere to go. That dead-end technology argument has become a reason to keep the project.

Secretary Hodel has said if he was starting it fresh, he might not recommend this project, but we ought to do it now. Otherwise, we will be losing a symbol of our commitment to the nuclear power.

Has anyone thought of what symbol we are talking about here? This symbolizes the industry with so little economic vitality that it can't cross financial street without government holding its hand. I don't know what the nuclear industry would look like had it taken the free enterprise approach. I do know that the current industry is a corporate welfare basket case. The welfare status has not been good for the nuclear industry, and I think we should all consider taking them off the dope, putting them back on the road to health by considering this plan, rejecting it and opposing all further subsidies to the Clinch River project.

Mr. Chairman, we have remarks from Jack Sheehan. Could I briefly read those?

The **Chairman**. Let me say that statement will be made part of the record.

[The prepared statement of Mr. Sheehan follows:]

Statement of Jack Sheehan, United Steel Workers

CLINCH RIVER DOES NOT HELP SOLVE OUR NATION'S SERIOUS BLUE-COLLAR UNEMPLOYMENT PROBLEM

The United Steelworkers of America and the International Association of Machinists and Aerospace Workers have opposed financing of the Clinch River Breeder Reactor for a number of years because of our strongly held belief that it is a gross misappropriation of scarce financial resources, and economically risky venture, and a threat to public and environmental health. This year, for largely the same reason, we continue to oppose both the project and the newly developed alternative financing plan design to bail out this unnecessary and risky expansion of nuclear-energy capacity.

American workers have very little to gain from development of CRBR. It is perhaps the most economically deficient and technologically suspect project the Reagan Administration has proposed. This is the same Administration that cut the Federal social budget and opposed funding for such critical areas as unemployment compensation, trade adjustment assistance, health care for the unemployed, mortgage foreclosure protection, food stamps for the unemployed, and a host of other unemployment related programs. Moreover, this is the same Administration that has actively opposed any new job creation or economic stimulas legislation.

The nuclear industry has fervently touted the labor benefits of this project. Proponents assert that the project will employ between 8,000–14,000 people during its peak construction period. The fact is there are at least 10 million unemployed workers in the United States who realize no benefits from this project. The General Accounting Office's estimated $8.5 billion pricetag for this extremely capital-intensive, one-of-a-kind plant translates into an expenditure of between one-half and one million dollars a job. At best, only 165 jobs are created for every $100 million invested in CRBR.

Is it sound policy to spend this much money on so few jobs for a project which offers virtually no long-term relief for the national unemployment crisis? Stable, long-term employment depends on a healthy economy and growth of the GNP. Today, there are factories and steelmills operating at 50 percent capacity. There are vital industries which are in trouble. Creating excess energy capacity with expensive experiments will not put our people back to work. Indeed, we lose nothing by cancelling Clinch; we don't lose a significant number of jobs; we don't lose any needed electric capacity; and we save a lot of money in the process, money that can better be used elsewhere.

If we are to be effective in providing jobs and training for unemployed Americans, support for the CRBR is an inappropriate and ineffective choice. We must confront the unemployment problem in a realistic and pragmatic manner.

There are alternatives. Public funds can be better spent on other energy technologies and in other sectors. We wholeheartedly support federal spending on economically efficient jobs and economic stimulation programs that provide a better return than the 165 jobs for every $100 million invested in the CRBR. Some of the better ways to invest these funds include:

(1) H.R. 2615, The Weatherization and Employment Act of 1983, sponsored by Representative Ottinger, is a prime example of a better federal investment. A Department of Energy commissioned study (written by scientists at Oak Ridge Associated Universities—the very same town that plans to house CRBR) recognizes that

every $100 million invested in weatherization programs 5,200 jobs are created (onsite and in associated manufacturing industries).

(2) The Administration's own Emergency Jobs Legislation (Public Law 98-8), commonly referred to as the "Highway Bill," creates about 3,100 jobs for every $100 million invested.

(3) H.R. 1036, the Community Renewal Employment Act, sponsored by Representative Gus Hawkins, would create 300,000 public service jobs or 10,000 jobs for every $100 million invested.

(4) H.R. 2544, sponsored by Representative Jim Oberstar, would create public works jobs rebuilding and repairing roads, bridges, ports and other economic infrastructure projects.

(5) The Trade Adjustment Assistance Act recently approved by the House to retrain thousands of workers who have lost their jobs to imports.

(6) Legislation to fund Solar Banks and solar energy technologies.

THE BOTTOM LINE

The political equation, CRBR equals energy equals jobs, simply does not stand up to serious analysis. Indeed, additional energy capacity of any sort does not automatically translate into greater employment or employment opportunities. More energy does not mean more jobs. Currently, at least there is a tremendous idling of productive capacity. The return of those facilities and workers is not dependent upon an increase in energy capacity. Furthermore, we are engaged in an industrial restructuring, the key ingredient of which is modernization and technological improvement of our industrial base. Among other ingredients, energy efficiency and cost-cutting are essential factors in such a revival. An over expansion of the energy base may, therefore, not only be unnecessary but may indeed induce high energy rates as utility producers are forced to increase rates due to lower consumption. Currently, we are experiencing the phenomenon in the Northwest where the aluminum industry is being faced with higher industrial rates—even in face of excess energy capacity.

Our union can fully appreciate the desire to stimulate employment. Machinists and Steelworkers are suffering the worst unemployment since the Great Depression, as are other workers in other industries and crafts.

This country needs a full employment policy commitment so that everyone who wants and needs a job can be gainfully employed.

Rather than waste time and precious resources on the CRBR, whose contribution to full employment is all but non-existent, the Congress should get on with the task of enacting legislation to create the kinds of jobs and economic stimuli that will have the broadest possible employment impact. Even in terms of an evaluation of BTU's produced or released and jobs, solar energy results in four times more employment than nuclear, and in the retrofitting of buildings and equipment the rate is three times. Basically, however, the need for Clinch River is tied to the notion of an ever increasing rate of energy consumption. But the rate of energy demand has actually been declining from approximately 7 percent between 1960-1973, to about 2.5 percent last year. Currently, the rate is flat. However, the energy industry has never caught up with the trend but has continued to overforecast consumption and capacity needs. The result has been the decommissioning of facilities. The financial markets have examined the potentials for energy growth and have concluded that further expansion would result in the construction of idle capacity. Construction of Clinch River would, therefore, only contribute to excess capacity and high rated capacity at that—which is no alternative to offshore capacity.

Mr. SMITH. Thank you.

The CHAIRMAN. In view of the hour, and in view of the fact they just rang the bell to go vote on the floor, I will be relatively brief.

Mr. Smith, are you in favor of public education, or should we better leave that to the private sector?

Mr. SMITH. I am in favor of the same type of proposals that have been suggested by this administration that we broaden the use of tuition tax credits in order to provide more competitive alternatives in the system.

The CHAIRMAN. But you still need some Federal money to some State-generated taxpayers money in public education.

Mr. SMITH. I think basically we are talking about a system where we are going to have a public involvement in education for the rest of our lives.

The CHAIRMAN. You approve that?

Mr. SMITH. As a member of the coalition, that's not something we deal with.

The CHAIRMAN. How about you yourself?

Mr. SMITH. My individual position? I think whenever possible, we should consider the boundaries between private and public areas and look carefully at each area. I think in this area those boundary lines might well, as the administration suggested, be rethought and allowed a broader participation in the private sector.

The CHAIRMAN. Specifically, do you believe it is legitimate to put taxpayers' money in public education?

Mr. SMITH. I went to a public school system. I got a good education.

The CHAIRMAN. You have been subsidized and you are part of the socialist network then.

Mr. SMITH. I am afraid in our society it is very difficult for anyone to avoid it.

The CHAIRMAN. Are you in favor of a system of public highways, or are you one of those advocates for all toll roads?

Mr. SMITH. I testified on this. In fact, I wrote the chapter in Heritage Engender in 1983 on the highway system, and I suggested that we might well move toward a system, at least in the interstate area, the inner-city area, of toll roads, both to provide a better highway system and a better, more tailored service quality.

The CHAIRMAN. I just wanted to get your prospectives, and your prospectives on this hearing today. I understand what your prospective is.

Mr. SMITH. I believe the private sector, wherever possible—I think one of the Senators——

The CHAIRMAN. Ms. Lancelot, are you familiar with the Southeast Energy Electricity Reliability Council reports with respect to the need for power in the Southeast?

Ms. LANCELOT. I can't say that I know it well. I know that the testimony in regard to what they said, there is a possibility there may be——

The CHAIRMAN. Did they indicate there would be a need for power in the southeast region in the early 1990's, or did they say there will be a surplus of power in the region in 1990's?

Ms. LANCELOT. Honestly, I cannot answer the question. I do know TVA has testified they do not see a need for electricity.

The CHAIRMAN. Does the plan before us, the plan the administration has presented to us, contemplate sales through TVA or sales outside of TVA?

Ms. LANCELOT. The original plan said sales through TVA.

The CHAIRMAN. That was the plan that is in current law and policy, not the plan presented to us; is that correct?

Ms. LANCELOT. I am a little unclear on that to tell you the truth. I think that is part of the problem. We haven't gotten a good exact answer, and I think it's a little fuzzy on what they are talking about.

The **Chairman**. Were you here earlier today when they were testifying?

Ms. **Lancelot**. No; I wasn't here for the entire testimony. I just want to make one point, and that is regardless, the sale of electricity in that region is uncertain. The need for power in the coming years is uncertain. TVA right now is overbilled.

The **Chairman**. Is that true outside of the TVA area as well as inside?

Ms. **Lancelot**. Again, I can't answer that for certain. I believe it is uncertain what kind of power needs we will have, and to base this kind of Government-assured project on such uncertainty in a time when budget deficit is at an all time high, there comes a time when we have to make hard choices.

The **Chairman**. I think I would be safe in assuming that both you, Mr. Smith and Ms. Lancelot are not in favor of the alternative suggested by the Congressional Budget Office in their comparative analysis, that is total federal funding.

Ms. **Smith**. In our testimony we oppose the Federal subsidies project, but in terms of the Federal cost, if you are going to do the project, a straight up-front subsidy would be less costly. We would oppose that, but I think in terms of your own position, it would be better to do it in a direct subsidy than an indirect subsidy.

The **Chairman**. But you would oppose it?

Mr. **Smith**. We would oppose it.

The **Chairman**. You would be here testifying before congressional committees in opposition of Federal funding?

Mr. **Smith**. We would rather not. We would rather see this thing dropped, but we would.

The **Chairman**. If that were the proposal, if the administration came up here and said we want to go with CBO's plan. It's less costly in the long run, and we want you, Congress, to appropriate the full $2.5 billion. You would not be up here in favor of that?

Mr. **Smith**. I can't speak for the coalition, but individually if you transferred the whole project over, lock, stock, and barrel, with no further Federal subsidies——

The **Chairman**. That wasn't my question. My question was with respect to the CBO analysis.

Mr. **Smith**. If that involves further Federal participation, we would oppose it.

The **Chairman**. And I assume——

Ms. **Lancelot**. The National Taxpayers Union does not believe in subsidies across the board.

The **Chairman**. And they do not believe in the Federal Government building this plant by itself?

Ms. **Lancelot**. That's true.

The **Chairman**. Would both of you say the Federal investment in national space research and development has been uneconomical and lack commercial character, and it was a waste of the taxpayers' money?

Mr. **Smith**. There was a research project trying to look at that question and it was published in Science magazine which I will leave for the record. It suggests that there are areas where in sense of a return or benefit you do get something. But it made the point, "* * * A fourth type of policy, under which the Government attempts to pick winners in commercial applied R&D, has been a clear-cut failure." It calls out specifically. "* * * lessons from the British-French Concorde experience is that we are lucky we went no further than we did with plans for an American SST." That is a direct quote, and as you know, we made the analogy time and time again that this is very similar to the SST. It was a commercial failure, and we think this will be too.

The CHAIRMAN. Do you think the national space research and development program has been a failure and did not justify the expenditure of taxpayers' funds?

Mr. SMITH. The coalition has no position.

Ms. LANCELOT. I don't feel qualified to answer that question.

Mr. SMITH. Does Government ever get something back for it's money? Yes, it does. That doesn't answer your question whether Government should be involved in this project. As you know, there is vigorous effort by the administration to try to privatize whether satellites and others——

The CHAIRMAN. Do you think there would be a need for weaker technology?

Mr. SMITH. We are not pro or antinuclear. We believe the market is the best way to decide when and how. There may be. I don't know. I think that is better decided—we've got an R&D program. I think now we ought to let the market decide whether they ought to commercialize the R&D.

The CHAIRMAN. You have stated that the utilities have not made any contributions to the project since 1977.

Mr. SMITH. That's right. We may be wrong. That's our understanding.

The CHAIRMAN. Are you aware that President Carter, in 1977, called for cancellation of the project?

Mr. SMITH. Yes, sir.

The CHAIRMAN. Instead of asking for participation, he said we are going to cut it all out.

Mr. SMITH. I understand that point, but you realize this new plan may very well reduce the private sector investment.

The CHAIRMAN. That is my point. You make the statement as though it proves something. There has been no private contribution since 1977. My point in response would be the President specifically said we are going to cut it off.

Mr. SMITH. But this administration took back that project and there have been weak attempts to try to solicit new commitments. We now, under this plan, essentially provide assurances.

The CHAIRMAN. They are now offering——

Mr. SMITH. It is no longer going to be a risk investment as it would have been under the old plan.

The CHAIRMAN. That is a different issue.

Mr. SMITH. But it was real risk money. Now it is not real risk money and there is a difference there.

The CHAIRMAN. Mr. Mudy, there have been some people who looked at the support of the organization which you represent. There are several organizations which you represent including CJET. Does that mean you are against all other technologies?

Mr. MUDY. Chairman McClure, I speak better for the building trades department than I do CJET. However, let me try to answer from both perspectives. The purpose of CJET is to promote energy and technology consistent with a benign environment, and as such we favor all areas of energy that may be of benefit to the public. Among others, we are currently very strongly favoring coal slurry pipelines. The building trades is—CJET I can't speak for in that case, but CJET does favor solar research and development, nuclear, thermal development of power, waste utilization. In short, our purpose is to promote for the people of this country abundant energy at the least cost that we can possibly produce it. We believe that this is consistent with that viewpoint.

The CHAIRMAN. Thank you very much for your testimony. I am sorry that we have been cut off by the bells. I have enjoyed the conversations with each of the witnesses this afternoon, and very much appreciate your testimony of this last panel as well.

The record will remain open for questions which may be submitted in writing for response in writing for the record for a period of 10 days. I appreciate the participation of each of the witnesses. Thank you. The committee is adjourned.

[Whereupon, at 6:05 p.m., the hearing was adjourned.]

[A statement submitted for the record from the National Democratic Policy Committee follows:]

NDPC National Democratic Policy Committee
P.O. Box 26 Midtown Station, 233 West 38th Street New York, New York 10018

Statement of the
National Democratic Policy Committee
submitted for the record on the
Clinch River Breeder Reactor

September 22, 1983

U.S. national security demands the rapid completion of the Clinch River Breeder Reactor. The National Democratic Policy Committee, representing 400 chapters and 25,000 members, supports the Administration's current efforts to provide financing to complete the project -- recognizing, nonetheless, that the Congress should never have acceded to the "private sector financing" trap in the first place.

The Soviet Union's destruction of KAL 007 has placed the world in the gravest strategic crisis in the post-war period. The Soviets are operating purely on a policy of strategic terror and on the medium term assessment that the U.S. economy will collapse under the weight of industrial depression and obsolescence and international financial disaster. The ONLY adequate response to the current Soviet posture is a defense and economic mobilization based on directed-energy beam weapons for ballistic missile defense and corollary civilian technologies. Such a mobilization must be based on the model of the World War II economic mobilization and the Manhattan Project. NDPC Advisory Chairman Lyndon H. LaRouche, Jr., has stressed repeatedly in the wake of KAL 7 that this awakening of the "sleeping giant" of American industrial might is the only action which will deter the current 1939-like mindset of the Soviet leadership.

Detailed studies by LaRouche's economics staff at the Executive Intelligence Review show, without a doubt, that the most serious bottleneck immediately encountered in an industrial gear-up of this type is electricity production. The current state of the U.S. electricity grid is already disastrous, even leaving aside the issue of an industrial mobilization. (see appended EIR article) Hence, the U.S., and the world, needs an enormous and rapid proliferation of conventional nuclear plants, and therefore, of necessity, the speedy commercialization of the breeder reactor. The much too-long delayed CRBR must be completed with dispatch. The most efficient approach would be to return the funding role to the federal government where it belongs. If political pygmies and saboteurs have indeed precluded that option, then move ahead with the current financing plan.

Imagine FDR's war mobilization stalled by demands that the auto companies provide private sector financing to get the bomber plants going. (After all, the auto companies would benefit massively after the war.) Adolph Hitler could not have asked for a more effective fifth column in the U.S.

So today, Yuri Andropov has no better friends in the U.S. than the witting and unwitting forces who attack Clinch River, WPPSS and who have crippled U.S. electricity generating capacity -- either using the ideology of environmentalism or of "free enterprise." In effect, the KGB and its assets in the environmentalist, anti-nuclear and "fiscal conservative" movements have launched a strategic bombing run against the U.S. electrical grid.

Ideologically, it was inevitable that the free enterprise fiscal conservatives and their libertarian adjuncts would ally with left-wing anarchists and environmentalists. Both reject the conception of man as a creator, engaged in the process of developing the universe and this planet, and reject the role of the nation-state in fostering that activity. The American System, as it was once known, is based on the activity of republican institutions of government in creating the appropriate climate of technological advance in which industrial capitalism can flourish. Efforts to negate that activity benefit only our enemies. But the alliance is more than ideological. The KGB has directly penetrated the "free enterprise" and fiscal conservative networks themselves, as the case of the Heritage Foundation and the National Taxpayers Union shows.

Since the KAL 7 shooting, NDPC candidates, running in local elections from New Hampshire to New York City to Seattle have won 21 elections, campaigning on the need for a crash program of beam weapon development and industrial mobilization. U.S. citizens understand and support this program. Moscow understands this program and seeks to stop it. The U.S. Congress must support it and must support the CRBR as a critical component of it.

for more information:
202/955-5934

Authorized and Paid for by the National Democratic Policy Committee

U.S. electrical grid collapse continues

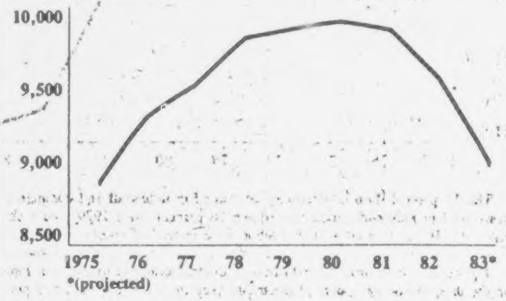
by David Cherry

The latest threat to the dwindling electric power supplies for U.S. economy, which have collapsed by 8 percent per capita since 1980, demonstrates the folly of the continuing actions of local elected officials, in concert with the KGB-run "nuclear freeze," to mothball local power plants and kill unfinished projects.

Just one week after New York Gov. Mario Cuomo hooked Long Island's largest electricity user, Grumman Aerospace Co., into upstate New York and Ontario power supplies which have been partially idled by the depression, one of the largest of those Ontario supplies began having serious problems during the second week in August. Following coolant leaks at the five-reactor, 3,000-megawatt Pickering nuclear complex in Ontario, three of the five reactors have been forced to close, with the Canadian press gearing up for a "new Three Mile Island" rampage. While there has been no serious accident at Pickering, two of the reactors will have to be closed for an extended period as a result of the leaks, quite independently of the howling of the press.

Cuomo, a Harriman protégé who has canceled three major New York State electric power projects in his first eight months in office, is preparing to mothball another, the completed Shoreham nuclear plant, by assigning "surplus" upstate power to Shoreham's major prospective customers. The power assigned is cheap because it is from older, amortized capacity idled by the depression, but such capacity is partially

Figure 1
Per capita kilowatt hours of electricity consumed in the United States



obsolete and subject to problems and service interruptions. The Cuomo operation will make any sustained future economic or industrial recovery for the state impossible.

Recently compiled figures, current through the 1983 "recovery" farce, show the still-accelerating collapse of the most vital economic indicator, electrical power use per capita and per operative in the labor force.

Since Federal Reserve Chairman Paul Volcker took office and raised interest rates in 1979:

- Electrical power use per capita for the *total population* has dropped 7 percent; 4 percent since the "recovery" was first announced in late 1982 (See **Figure 1**);
- Commercial and industrial electrical power use per *employed* member of the labor force has dropped by 8 percent since 1979 (See **Figure 2a**);
- If the *unemployed*, many of whom Volcker threw out of work, are added to that labor force, commercial and industrial electrical power use per member of the *total work force* has dropped by 11 percent since 1979;
- *Industrial* electrical power use fell by 15 percent per *employed* member of the work force;
- If the unemployed are included, industrial use of electrical power per member of the total work force has fallen by 19 percent since 1979. This last figure is the broadest measure of the disappearing *potential* for a future industrial recovery of production and high-technology employment (**Figure 2b**).

Turning off the power

Electrical power use reached its historical peak in 1979 just before Volcker began the depression, and has fallen continuously since then through mid-1983. None of this collapse, therefore, resulted from Jimmy Carter's earlier energy conservation campaign. The 7 percent drop in total electrical power use per capita since 1979, given that both the population and the labor force have continued to grow since that time, is the equivalent to *turning off 40 full-sized, 1000-Megawatt power plants*. This collapse has been accomplished by shutting down existing plants and mothballing those nearing completion, as the depression continued to drive down electricity use. As the case of the Washington Public Power Supply System shows most graphically, the process of reopening plants or restarting construction becomes very difficult once the power-producing entities have been declared bankrupt.

What recovery?

The latest national electricity production figures for January through June 1983 refute the claims of an incipient recovery. The six-month figures show a 2.4 percent drop over the first six months of last year, after a 2 percent drop in 1982 from 1981. Under conditions of normal growth, national electricity production figures do not fluctuate, but grow steadily, as shown in Figure 1, even during the adverse circumstances up to 1979. Region by region, the six-month figures for 1983 are the worst for the West South Central region (Arkansas, Louisiana, Oklahoma, and Texas), where electricity production declined by 5.8 percent; the West North Central region (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota) suffered a 4.0 percent drop; the Pacific region (California, Oregon, and Washington) fell by 4.0 percent; and the Mid-Atlantic region (New Jersey, Maryland, Pennsylania), by 3.7 percent.

Figure 2a

Electricity consumed in industrial and commercial enterprise per employee

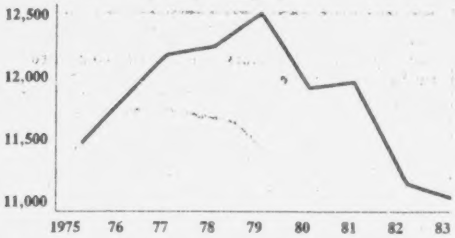
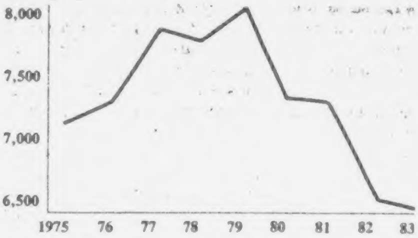


Figure 2b

Electricity used in industrial production per member of the labor force, employed and unemployed



The 11 percent drop in electricity consumed in industrial and commercial enterprise per employee since 1979 reflects an absolute drop in electricity consumed in industrial production (down 16 percent since 1979) and a shifting of the production process away from electricity intensity toward labor intensity. By using total available labor force instead of employed labor force, we prevent rising unemployment from moderating the fall in this ratio. Total available labor force has continued to grow—although slowly—over the past decade, as has the population as a whole.

The decline in the fruits of industrial production available to the labor force (employed and unemployed)—and to the population as a whole—is reflected in the drop of kilowatt hours of electricity used in industrial production per member of the labor force, employed and unemployed.